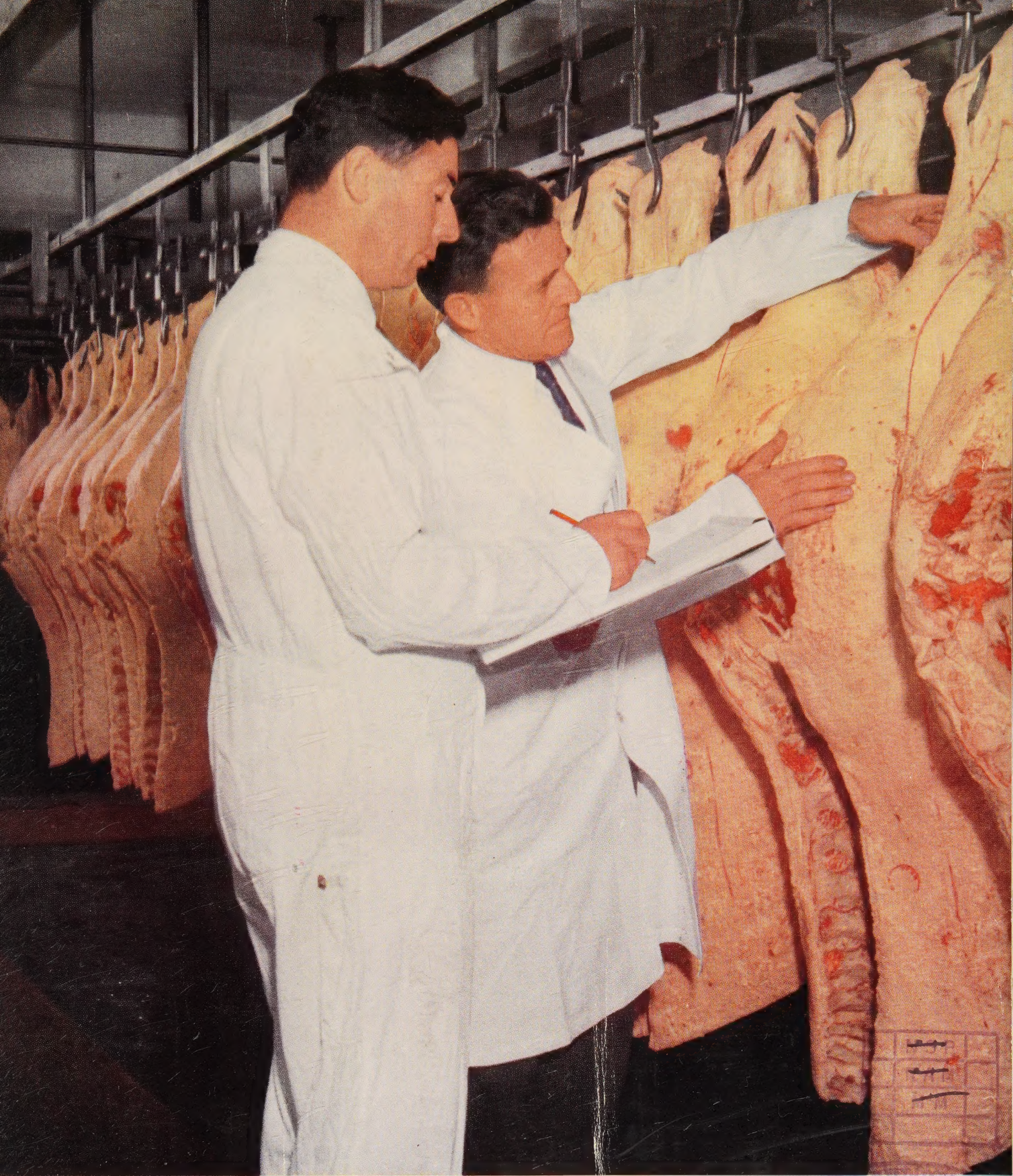




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The quality of New Zealand meat sold both locally and overseas is safeguarded by strict inspection and grading. Local meat, such as the beef shown on our cover this month, has distinctive grade markings (red stripe, first grade in this instance).

[Sparrow photograph]

LAND DEVELOPMENT on the WEST COAST of the South Island

WHAT place has land development in the economic future of the South Island's West Coast?

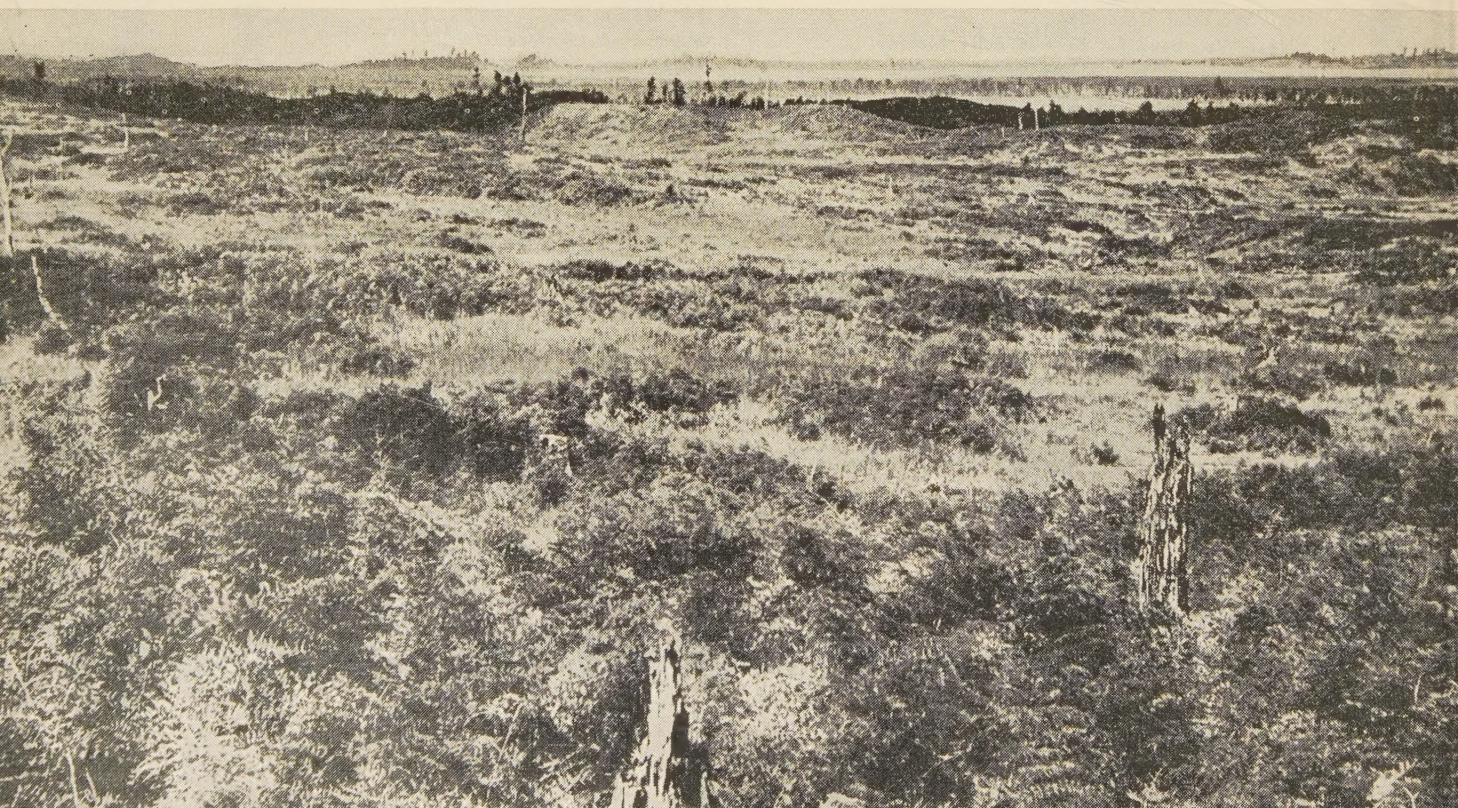
The West Coast Committee of Inquiry, set up by Government primarily to investigate industrial development, has no doubt about the importance of farm expansion on the West Coast. In the committee's report published recently several recommendations were aimed at achieving more intensive use of farmable land for, as the report says,

Studies have shown that there is a marked relationship between the productivity of farming carried on in an area and its rate of population growth.

First among its proposals for farming development of the West Coast the committee supported continued expansion of large-scale land development by the Department of Lands and Survey.

By P. H. C. LUCAS,
Administrative Assistant,
Department of Lands and
Survey

▼ Land in the Bell Hill-Kotuku area before development, showing the cover on the morainic soils of the district.



The potential realised:
long evening shadows
and grazing sheep
make a pleasing
pattern on a South
Westland farm.



TODAY the Department of Lands and Survey has 18,535 acres in development blocks and another 4,400 acres available for extension of development on the West Coast. The land is in eight blocks from Cape Foulwind in the north to Whataroa in the south. Except for 760 acres in Ahaura Farm Settlement, all the land has been taken in hand since 1956.

In that year the Lands Department's Land Utilisation Division carried out a full-scale investigation of the West Coast region extending from Karamea to the Waiho River and covering more than 3½ million acres.

The survey classified the land into three classes—farmable, marginal, and unfarmable. It recorded the present land use, the tenure on which the land was held, identified areas of greatest potential for development, and pointed the way to the expansion in land development that is taking place today.

Early Government land development on the West Coast was mainly experimental to assess the possibilities of the nearly level open pakihi land near Westport. Heavy rainfall, about 100 in. a year, has left the pakihi soil without structure, with a hard pan below the surface, and with so little "drawing" power that parallel drains leave wet, boggy land between them.

In cooperation with the Cawthron Institute, the Department of Lands and Survey started development on the 1,500-acre pakihi block at Sergeant's Hill, north of Westport, in 1935. Work was halted in 1941 because

new pastures had not stood up to intensive stocking and the English grasses would not "hold". The block has since been leased for grazing to local farmers. The pakihi remain a problem, but experimental work by private farmers and Government agencies goes on.

The Lands Department's job was to bring extra land into grass, improve pastures, and erect extra buildings and fences where they were needed. Thirty ex-servicemen were settled on developed farms on the West Coast between 1949 and 1955. The area settled totalled 8,117 acres and 23 of the 30 farms were dairy properties.

Since then, blocks taken in hand on the West Coast by the Lands Department have been long-term propositions where a longer period of development is needed to bring difficult country into pastures capable of standing up to the intensive farming which follows subdivision and settlement as individual farm units.

Costs of development are higher than in other districts such as Rotorua, but as the South Island Local Bodies Association said in their booklet "A Land Policy for the South Island" cheapness is not the only factor that should influence a decision on which areas should or should not be first developed.

That scope exists for development on the West Coast was shown by the "Report on the Land Utilisation Survey of the West Coast Region" completed late in 1956 and since published by the Lands Department. While the report showed the farmable area of the region to be very limited—only 8.6 per cent of the total area—it also showed that only 4.2 per cent is actually farmed. Figures for land classification are:

WEST COAST DEVELOPMENT

BLOCKS

Farm settlements acres

Ahaura	2,199
Bell Hill	9,186
Cape Foulwind	2,600
Duart	997
La Fontaine	715
Raft Creek	1,138
Rimu	800
Rotokino	900

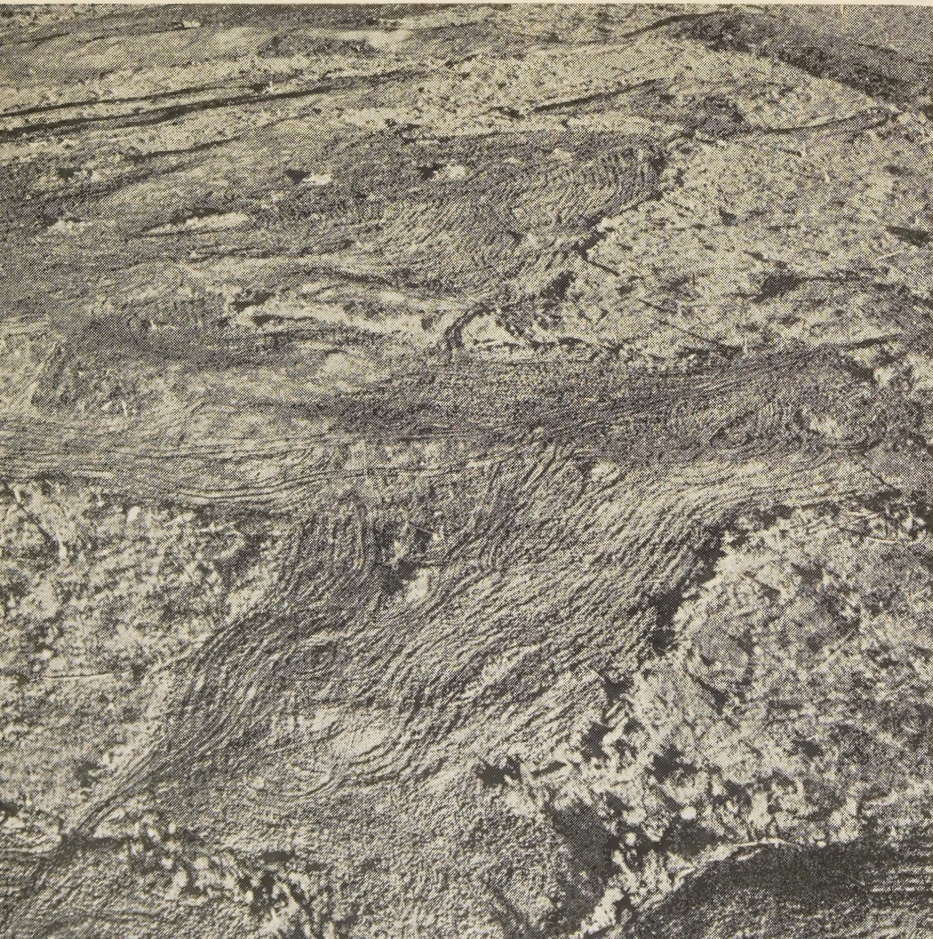
18,535

Development immediately after the war aimed at providing farms to rehabilitate ex-servicemen. Most of the land used for this was already partly developed; some of it was in larger properties capable of subdivision and other areas were a combination of smaller units consolidated into economic farms.



▲ Bell Hill Farm Settlement, near Lake Brunner, showing the broken nature of the country, the cultivation pattern, and the airstrip and access track.

▼ Not the face of the moon, but the pattern of cultivation on Bell Hill, photographed from the air.



	acres	per cent
Farmable land ..	332,400	8.6
Marginal land ..	441,700	11.5
Unfarmable land	3,080,700	79.9
	3,854,800	100.0

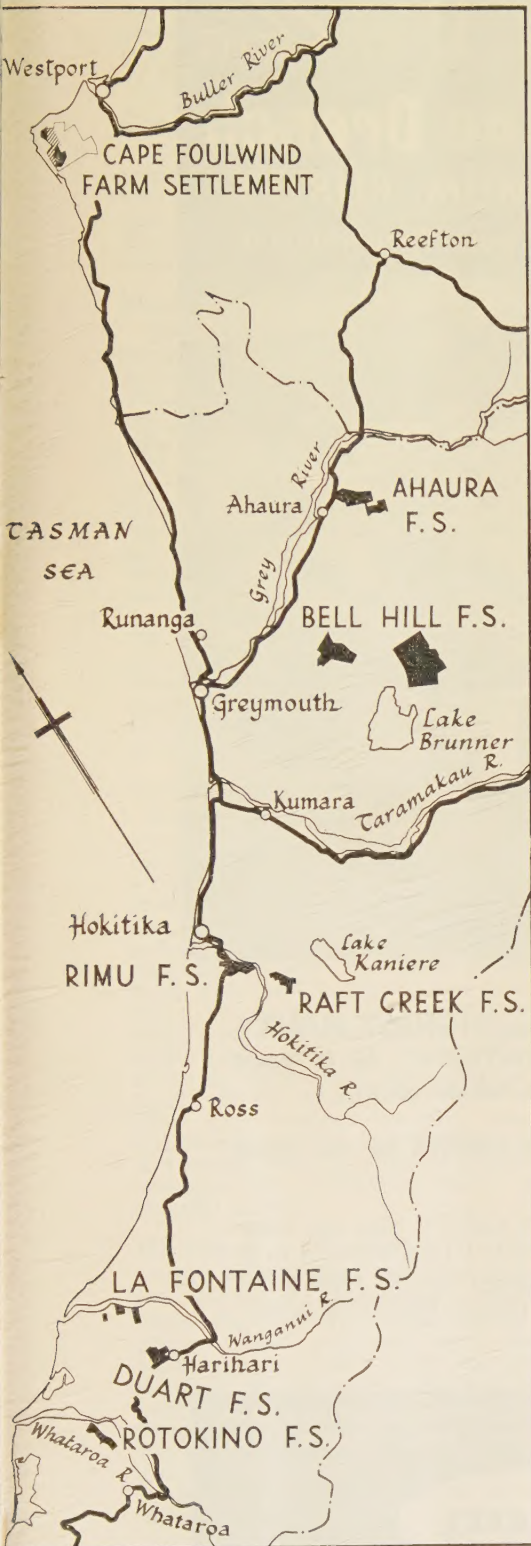
North Auckland, with a total of 3,790,000 acres, has 2,708,000 acres classified as farmable land. Of the West Coast's 332,400 acres of farmable land, only 99,000 acres is in grass and another 63,500 acres in scattered grass.

The report commented that further development of the West Coast's farming potential would not be economic today but for the network of roads and highways running the length of the West Coast, a heritage from the past and from tourist traffic. It connects all the farming areas, which are in a series of isolated pockets and narrow strips.

The report estimated that a fourfold increase in West Coast farm production was possible by doubling the area of land farmed and by doubling production from land already being farmed.

The two major problems of large-scale Government development are that the farmable land is scattered and that most of it is privately owned. To expand development suitable Crown land is used as a nucleus, where possible, and adjoining private land purchased by negotiation, so building up consolidated blocks with sufficient scope for large-scale operations. The 9,186-acre Bell Hill Farm

FARM SETTLEMENT BLOCKS



Settlement was built up this way by the purchase of eight separate properties and the use of vacant Crown land.

The eight blocks on which development is now being undertaken are all under the supervision of the Commissioner of Crown Lands at Hokitika, Mr J. Fitzharris. The pattern being followed is similar to that by which the Lands Department has settled over 3,600 men on more than 1,300,000 acres of land throughout New Zealand.

Contractors carry out cultivation, grassing, and fencing, after which the land is farmed to consolidate the pastures and control the tendency for regrowth of scrub and weeds. This is all a necessary preliminary to the closer subdivision which follows.

Ahaura Farm Settlement

First of the present areas brought under development was Ahaura Farm Settlement. Located four miles from Ahaura, the area was mostly covered by gorse and stunted manuka when work was started on the original 421 acres. With the encouraging results from the initial development, the work has been extended to adjoining land and now extends over 2,199 acres.

Stock numbers have been built up. At 30 June 1960 there were 4,877 sheep, including 3,513 breeding ewes, and 276 run cattle.

Gorse regrowth is still a problem here, but as soon as this is overcome five or six fat lamb units will be offered for settlement.

Rimu Farm Settlement

In 1956 work was begun on Rimu Farm Settlement, an 800-acre cross-section of Westland's problem lands. The block runs back from the south bank of the Hokitika River to terraced hills and was a tailings reserve in mining days. About 200 acres are in pasture, including some on difficult soil. It is now intended to observe the effects of stocking on the grassed area to gauge the potential of the types of land grassed.

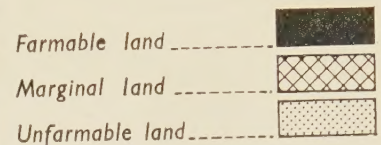
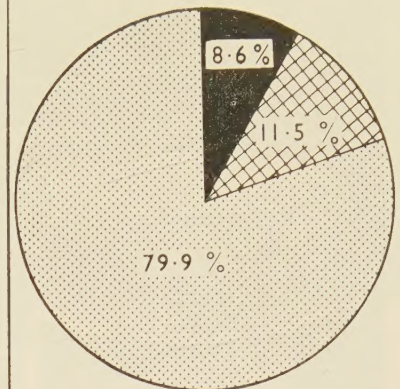
Bell Hill Farm Settlement

Bell Hill Farm Settlement, about 20 miles from Greymouth, contains 9,186 acres of cut-over bush country near Lake Brunner which was badly reverted when taken over. This land was described in the Land Utilisation Survey report as being "covered with fern and light scrub with a plentiful crop of logs and stumps. These morainic soils also contain many irregular rocks and boulders, some of them very large".

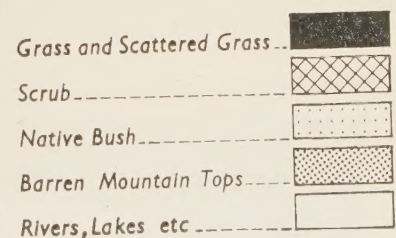
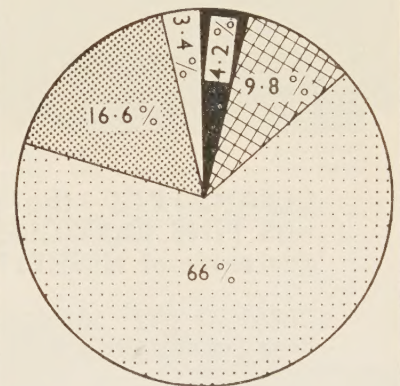
Farm buildings have been erected, an airstrip constructed, and 28 miles of fencing erected. Nine hundred acres have been cultivated and grassed and the block is now carrying 1,850 sheep (1,250 of them breeding ewes)

LAND DEVELOPMENT

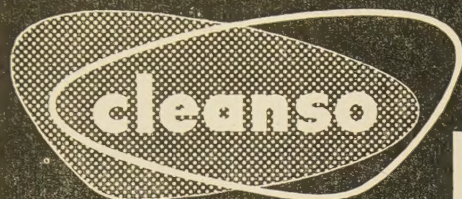
LAND CLASSIFICATION



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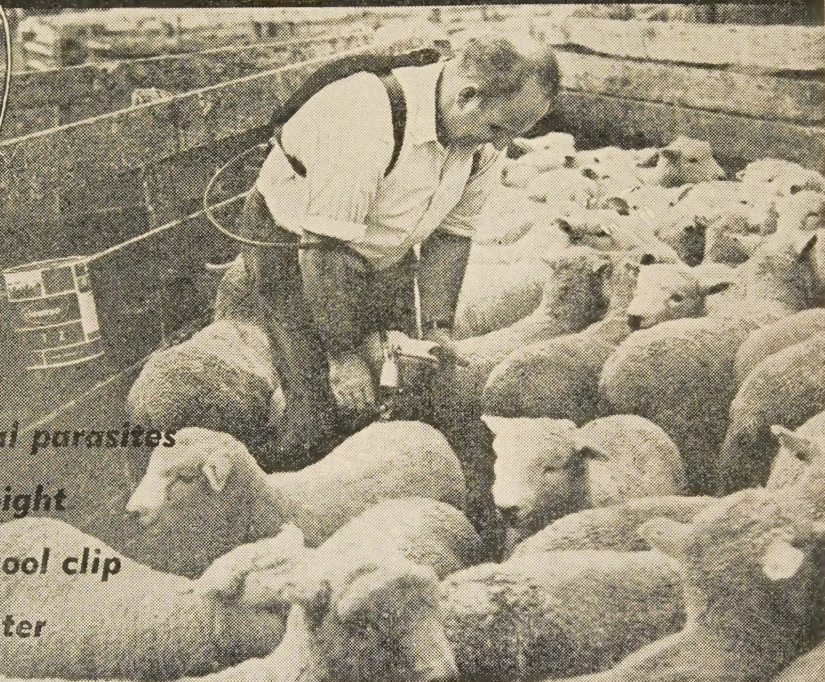


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and 268 run cattle. A further 1,000 two-tooths were to be bought this spring.

Commenting in its report, the West Coast Committee of Inquiry said, "we must record how impressed we were with the high standard of development work that has taken place at such areas as Bell Hill. In our opinion this outstanding work reflects great credit on the Department".

Cape Foulwind

In the past year a start has been made in the development of 2,600 acres out of a 7,000-acre block of Crown land at Cape Foulwind, near Westport. Though the block is not attractive, the results should be worth while.

Westland

This year the Lands Department has bought properties to establish four more development areas in Westland. Three properties make up the 1,138-acre Raft Creek Farm Settlement, near Kokatahi, planned for subdivision into dairy units. At Harihari there are two blocks: Duart Farm Settlement, 997 acres of semi-swamp, which, after completion of the present drainage scheme being undertaken by the Westland Catchment Board, will be developed into dairy units; and La Fontaine Farm Settlement of 715 acres, which will also be developed for dairying. Further south at Whataroa work has started on development of Rotokino Farm Settlement, an area of 900 acres suitable for fat lamb and dairy units.

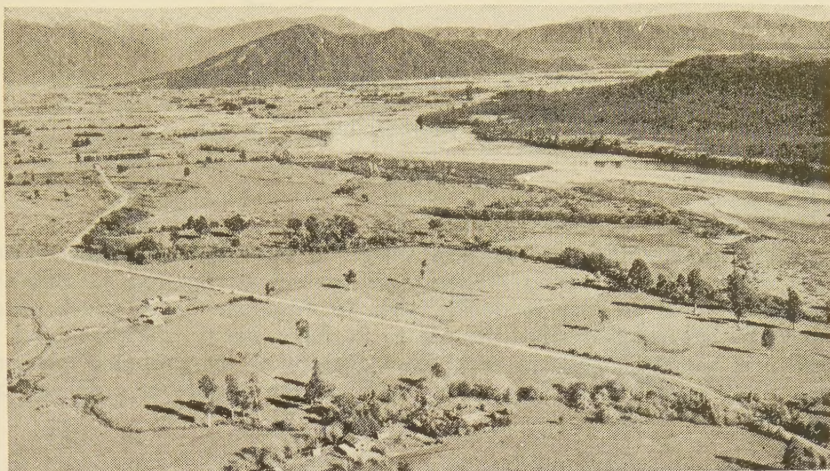
Private Land Development

Private land development is also being stimulated through the Marginal Lands Board. The Board administers a rural credit scheme designed to assist farmers on marginal land with advice and finance for approved development programmes. This scheme is also operated through the Lands Department with local inspection and supervision by marginal lands committees. Each committee includes an experienced local farmer and representatives of the Departments of Agriculture and Lands. So far 100 farmers on the West Coast have received Marginal Lands Act finance totalling over £200,000 and, as a result, there have been significant increases in production from individual farms.

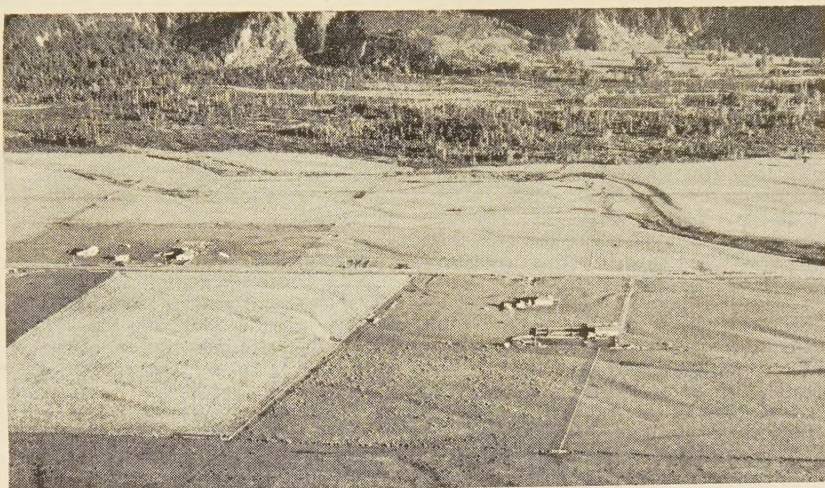
The Future

The West Coast has just ended 100 years of development during which the land has yielded wealth in plenty. Gold and coal have been taken out, the native forest has been cut, and all too often the land has been left marred and unproductive. Today's development is aimed at converting this land into an asset in perpetuity. Success in this could well herald a new era of progress for the West Coast.

LAND DEVELOPMENT ON WEST COAST



Dairying land on the Kokatahi flats near Hokitika. Raft Creek Farm Settlement, being developed by the Lands Department, is near here.



▲ Ahaura Farm Settlement, where initial development on 421 acres of overgrown alluvial flats has been extended to 2,199 acres. The homestead is on the right.

▼ Good farming flats in the Harihari district, where the Lands Department now has two development areas.



How to Plan Irrigation Needs of Land

By J. F. GABITES,
New Zealand Meteorological Service

HOW much water does the land need? If there were a simple, cheap device for measuring the moisture content of the soil at different depths it would be easy to decide when to irrigate and how much water would be needed to restore the soil to its full capacity. Without such a device it is often helpful to keep some account of the probable moisture gains and losses so that the current needs of the pasture or crop can be assessed.

IT is quite easy, with the aid of a rain gauge and a notebook, to keep a tally of the amount of rain that falls on the farm, but the problem immediately arises: What allowance should be made for evaporation (which includes transpiration from the plants themselves) and run-off? This is where the meteorologist is called in.

Measurement of actual evaporation into the atmosphere is quite tricky and needs the kind of elaborate instrumentation found only at research stations. It is much more difficult than the measurement of the moisture content of the soil itself.

Measurements of the daily water losses from evaporimeters—those shallow water tanks set near ground level at a number of meteorological stations—give an indication of the ability of the air to induce evaporation from a water surface but not necessarily any reliable indication of the evaporation from the surrounding countryside.

It is true that some approximate relationships have been established between tank evaporation and water losses from pasture, but at best they apply only with fairly moist soil and they fail when most needed, for example, when the countryside is dry and the air, picking up little moisture from the ground, is in a condition to induce rapid evaporation from the tank. Over Australia, to quote an extreme case, the apparent annual evaporation assessed from tank measurements amounts to more than five times the water known to fall on the continent as rain!

In planning or operating irrigation schemes it is often necessary, in the absence of direct information, to resort to approximate calculations of evaporation based on weather records. A number of formulae of varying com-

plexity have been devised for this purpose.

One of the simplest and most successful in practice is that developed in the U.S.A. by Dr C. W. Thornthwaite for calculating the water needs of pasture from the average air temperature and the length of day (sunrise to sunset). The particular relationship varies from one climatic district to another, but can usually be identified sufficiently well from the nature of the annual cycle of temperature.

A more elaborate system developed in the United Kingdom by Dr H. L. Penman tries to take into account such factors as the gain or loss of heat from the ground by radiation, the humidity of the air, and the windiness. Unfortunately some of the adjustments are so uncertain that the calculations are not necessarily more accurate than those made by the simpler Thornthwaite method. In spite of the limitations, judicious use of these two methods of calculation can be helpful.

The accompanying maps of the average water needs of pasture each month have been produced to assist farmers in planning irrigation operations. They are based largely on calculations by the Thornthwaite method for a wide network of meteorological stations, modified where considered appropriate after comparison with calculations by the Penman method for a selection of stations and also with evaporimeter measurements. They are not intended to apply to hill

country, but should serve for most farm crops besides grass.

Though the water needs in each month are expressed as average daily amounts, it should not be expected that they will provide accurate indications for individual days. There will be cloudy, cold, damp days when the evaporation will be only a fraction of that shown and there will be warm days with drying winds when the evaporation will be much greater. The same kind of error may recur on several days in succession. From a practical point of view the cumulative error over a week or a fortnight is not likely to be very serious, and over a month there is a good chance of most of the errors cancelling out.

In some places it is advocated that the evaporation should be calculated from the weather records week by week or even day by day instead of from long-period averages or "normals". In view of the uncertainties in the calculations over short periods and factors not taken into account such as the aspect of the farm, its exposure to winds, and differences from the meteorological station, this refinement is of doubtful value.

The bookkeeping involved in a rough account of the water budget of the soil is quite simple and may be summarised as follows:

Assume that evaporation continues every day at the rate shown in the map of average water need for the month;

Begin accumulating the daily losses from some convenient date, for example, in late winter, when the ground is saturated;

Reduce the accumulated soil moisture deficit by the amount of rain that falls or the water that is applied;

Assume that if more rain falls than is needed to cancel the deficit, the surplus is lost as run-off.

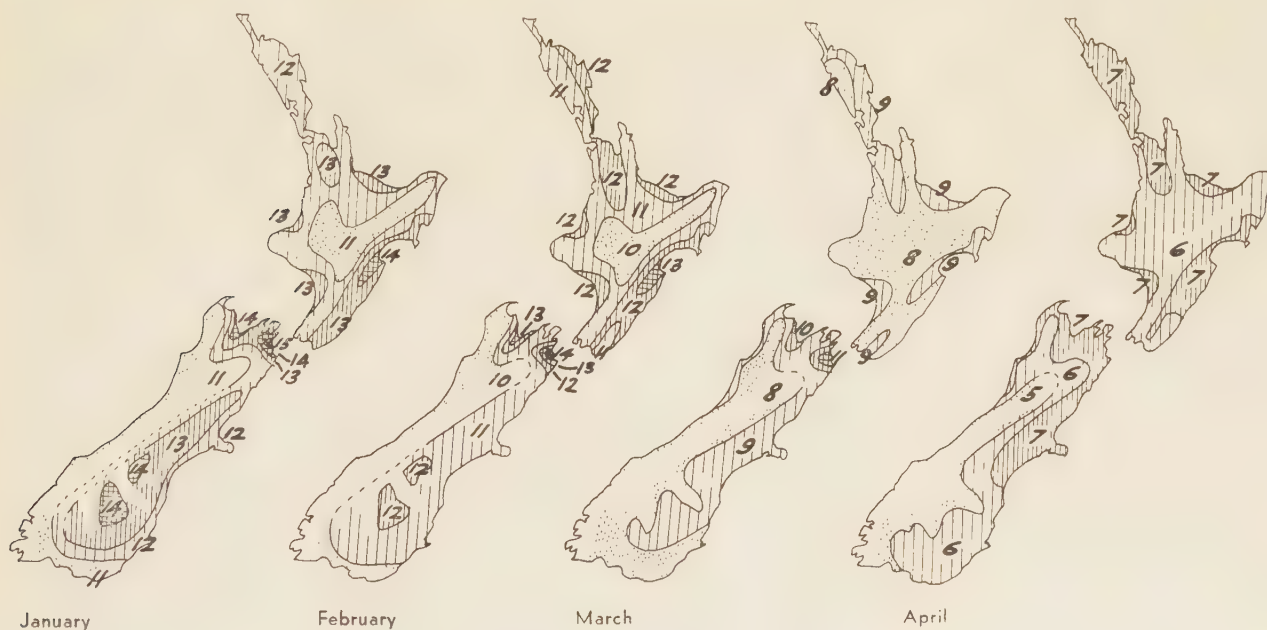
The following is an example of a tally beginning after rain on 5 September that wetted the ground to field capacity:

Date	Water gain (rainfall or irrigation)	Water loss (evaporation at rate of 0.05 in. per day)	Accumulated deficit	
	inch	inch		
6 to 12 September ..	.. —	0.35	(0 + 0.35)	inch = 0.35
13 September ..	.. 0.15	0.05	(0.35 + 0.05 — 0.15)	= 0.25
14 to 19 September ..	.. —	0.30	(0.25 + 0.30)	= 0.55
20 September ..	.. 0.40	0.05	(0.55 + 0.05 — 0.40)	= 0.20
21 September ..	.. 0.55	0.05	(0.20 + 0.05 — 0.55)	= 0
			(0.30	run-off)
22 to 30 September ..	.. —	0.45	(0 + 0.45)	= 0.45

AVERAGE WATER NEED



The estimated average rate of loss of moisture by evaporation from pasture in the eight months September to April is shown by the figures in the different areas of the maps. The amounts given are hundredths of an inch of water per day.



How large a moisture deficit can safely be allowed to build up before growth is seriously affected will depend on many factors such as the nature of the crop and its depth of rooting, but it may be noted that in summer the deficit will grow during rainless periods at a rate of about

1 in. per week; weekly applications of water would therefore ensure that the deficit never grew to much more than the equivalent of 1 in. of water.

This method of keeping a tally on the moisture content of the soil with rain gauge, notebook, and table of average daily evaporation losses

results in a great over-simplification of many of the factors involved. Very accurate results must not be expected. Nevertheless if better information is not available, this simplified system may serve as a basis for practical operations.

Every Calf Must be Vaccinated to Control Contagious Abortion

By the Animal Industry Division

CONTAGIOUS abortion of dairy and beef cattle is a major infectious disease causing considerable financial loss in every country where cattle are farmed. The cause of the disease, the organism *Brucella abortus*, has been known since 1897 and an effective vaccine has been available in New Zealand since 1943.

OUR national beef and dairy herds have been infected since cattle were first introduced, and before vaccination was practised the annual losses were very high. A survey of dairy cattle in 1940-41 showed an abortion rate varying from 10 to 3 per cent depending on the age of the cows, the highest rate being in two-year-old cattle calving for the first time.

Vaccination has markedly reduced the over-all incidence. It could be reduced to negligible proportions if vaccination were complete throughout our herds.

In the unprotected herd the financial loss caused by brucellosis is often very considerable, and as high as 20 per cent of the cows can abort in any one year. When a cow aborts it costs the farmer:

1. The loss of a calf.
2. An average loss of about one third of the normal milk yield of the cow for that lactation.
3. A possible loss through infertility after abortion.
4. Further losses by the spread of the disease through the herd.

In addition there is a serious danger of infected milk or discharges carrying the disease to humans and causing undulant fever.

Infection gets into or is spread through a herd by the eating of fodder or the drinking of water contaminated by *Brucella abortus*. The organism can also gain entrance to the animal body by way of the eye or through the skin.

If a pregnant cow becomes infected, abortion may follow, but even if it does not, the calf, afterbirth, and discharges will contain millions of *Brucella* organisms which, by contaminating the pasture, fodder, and drinking water, constitute dangerous sources of infection.

Spread of Infection

Infection can be spread from a neighbouring infected farm through dogs or vermin gaining access to afterbirths or other infected material. A cow may become infected by licking the skin of another animal contamin-

ated by infected discharge. The infection can be spread in the milk, through the bull, or by buying in infected stock. Infected cows generally abort only once and calve normally afterward, but the apparently normal afterbirth and discharges continue to be dangerous sources of infection.

When a clean herd is first infected the abortion rate is high, but it declines as time goes on until cases are confined almost entirely to heifers introduced into the main herd. Older cows which have aborted acquire resistance to infection and carry their calves full term provided they are fertile after the first attack.

Though it is estimated that three-quarters of our dairy calves are vaccinated each year, there are still considerable losses in both dairy and beef

herds and particularly serious losses to individual farmers.

Vaccination is effective, safe, and cheap; for a trifling annual cost every farmer can completely protect his herd. It is best done in heifer calves between four and eight months old and must be applied every year to successive crops of calves to achieve its objective. Single vaccination at the calf stage will produce an immunity at least up to the time of fifth calving; in practical terms, a lifetime immunity.

Vaccination may be used in any herd, however badly infected, to prevent further spread of infection; and continued freedom from disease can be ensured by subsequent annual vaccination of calves.

One in four dairy farmers are not yet vaccinating; others have become lulled into a false sense of security through continued freedom from abortion in a vaccinated herd and have discontinued their annual programme. Many beef farmers are not aware of the economic loss that can be prevented and the better planned farming that can be attained through this safe and simple procedure.

Every farmer is strongly advised to vaccinate his calves and help to achieve a major step forward in the complete control of this dangerous disease, the losses from which can be so easily prevented.

Radio Broadcasts for Farmers

RADIO broadcasts for farmers will be given in December as follows:

2XG Gisborne, 8 p.m.

13 December—"For the Orchardist", by J. Overbye.

20 December—"Making a Lawn", by H. deO. Chamberlain.

2XA Wanganui, 8 p.m.

1 December—"For the Country Women", by Mary Macdonald.

8 December—"Farming News".

15 December—"Sheep and Wool Notes", by P. C. Marshall.

2YZ Napier, 7.10 p.m.

6 December—"Farming Editor's Summary", by R. G. Montgomery.

3YA Christchurch

5 December—"Table Poultry", by H. H. Watson.

19 December—Review of "The New Zealand Journal of Agriculture", by E. G. Smith

4YA Dunedin and 4YZ Invercargill, 12.36 p.m.

5 December—"Catchment Control", by W. O. Sly.

12 December—"Pollination of Legumes", by D. W. A. Seal.

19 December—"Review of 1960 Farming World", by D. H. Le Souef and G. K. McPherson.

Regular Sessions

1YA Auckland, Mondays at 12.36 p.m. Tuesdays, Wednesdays, Thursdays, and Fridays at 7.45 p.m., Thursdays at 12.33 p.m.

1XN Whangarei, Mondays at 8 p.m., Wednesdays at 8 p.m., and Fridays at 12.33 p.m.

1XH Hamilton, Mondays at 12.36 p.m. (excluding first Monday in month and public holidays), Wednesdays at 12.33 p.m.

1YZ Rotorua, Wednesdays at 7 p.m., Thursdays at 12.33 p.m.

2YZ Napier, Tuesdays at 7.10 p.m., Thursdays at 12.33 p.m.

2XG Gisborne, Tuesdays at 8 p.m.

2XP New Plymouth, Thursdays at 8 p.m.

2XA Wanganui, Mondays, Tuesdays, and Thursdays at 8 p.m.

2XB Masterton, Fridays at 6.45 p.m.

2XN Nelson, Thursdays at 8 p.m.

2ZA Palmerston North, Mondays at 12.36 p.m. and Fridays at 8.30 p.m.

2YA Wellington, Mondays, Tuesdays, and Fridays at 7.10 p.m., Thursdays at 12.33 p.m.

3YA Christchurch, Mondays at 12.20 p.m., Thursdays at 12.33 p.m. and 7.10 p.m.

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Hill Country Spray Plant

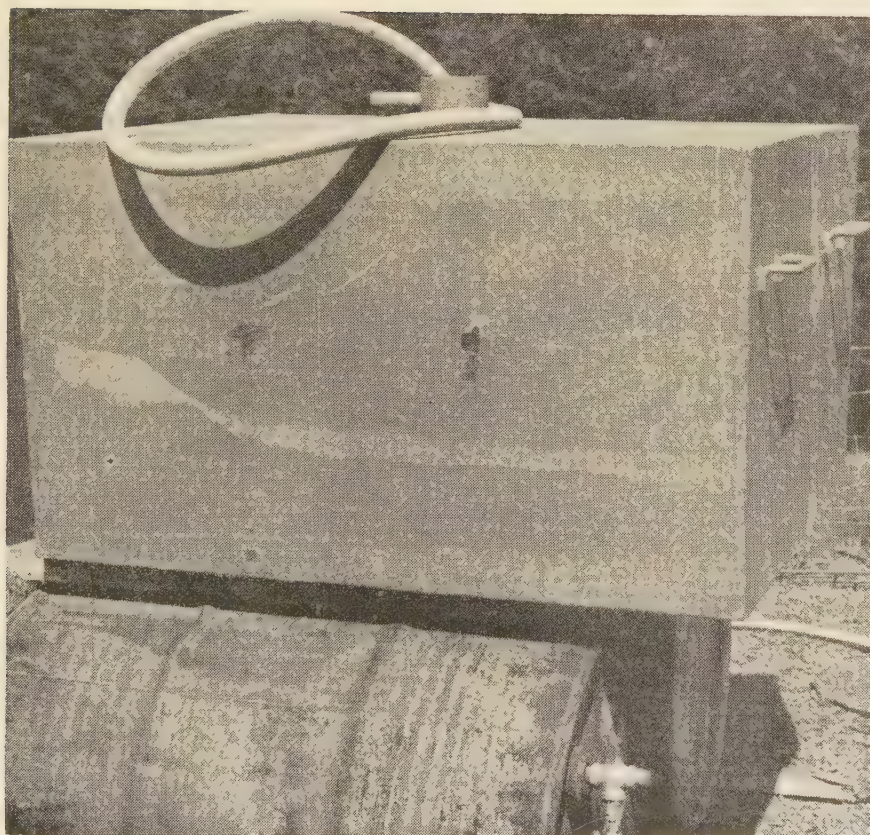
THE ease of spraying gorse and blackberry over rough country has been greatly improved by use of the plant illustrated, designed by G. Umbers, formerly Farm Manager of the Department of Agriculture's Whatawhata Hill Country Research Station.

The equipment comprises a tank designed to fit in the towing vehicle and a trailed hose reel and snap couplings for the hose fittings and gun. Attached to a vehicle or tractor, it can be taken to the crest of ridges or along gully sides and the hose pulled out from the reel as necessary to work either side of a course downhill up to 400 ft.

When the area has been completed, the hand gun is simply unsnapped from the hose. The operator returns to his unit carrying the hand gun and unencumbered by the heavy hose lead. He releases the over-running brake on the reel and quickly reels in the line, moves the vehicle on, and begins the next spray section.

From such a fixed point either side of the hill can be treated and the spot spraying of individual plants hastened.

By J. D. CURRIE, and J. L. DOUTRE,
Farm Advisory Officer, Farm Machinery Instructor,
Hamilton, Auckland,
both of the Department of Agriculture



← The tank illustrated fits compactly between the two back seats in the vehicle, with the pump sited on one side.

When spraying is in progress a lead from the tank is taken to the trailed reel shown on page 445 and is coupled on to the short length of hose entering the hollow centre of the reel drum by a swivel union.

A further length of hose leads to the outside of the drum where it joins the main hose reel. The spray gun is attached by a snap coupling on the end of this hose.

Advantages in the Design

The tank is shown on top of two 44-gallon drums that were previously used when spraying was done from a tray behind a tractor. The new tank holds 120 gallons and its siting provides extra traction for the back wheels of the towing vehicle.

Hand grips at each end enable easy handling and six internal baffles prevent surging of the liquid.



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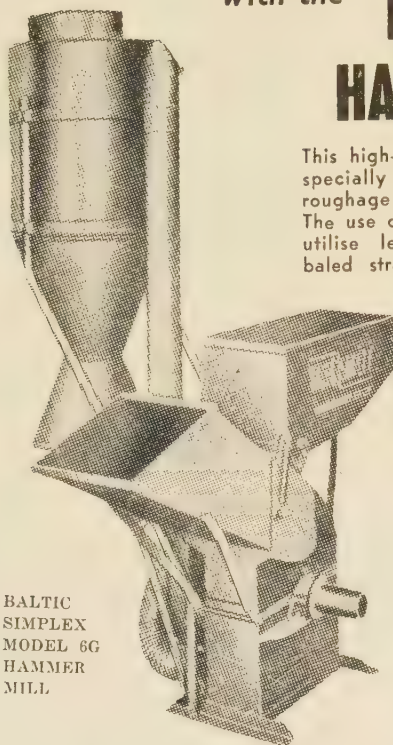
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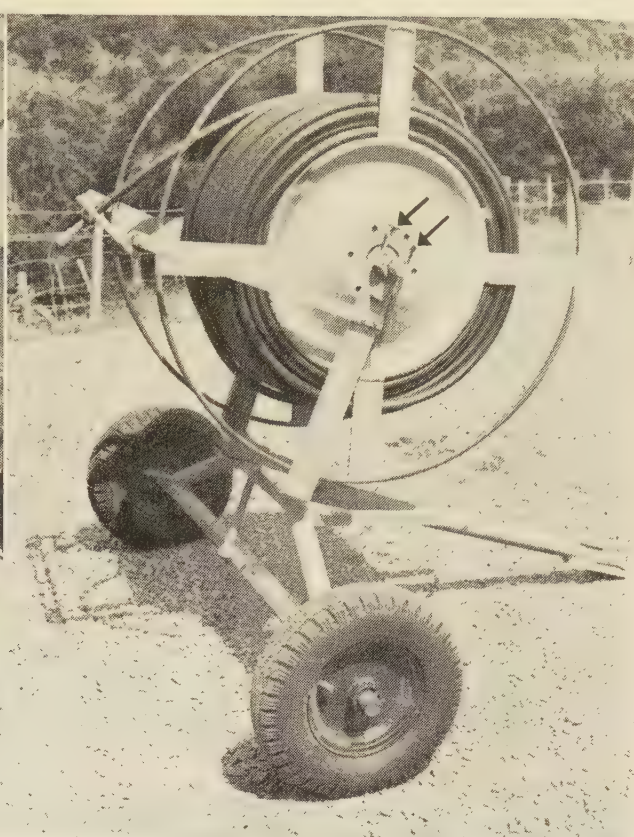
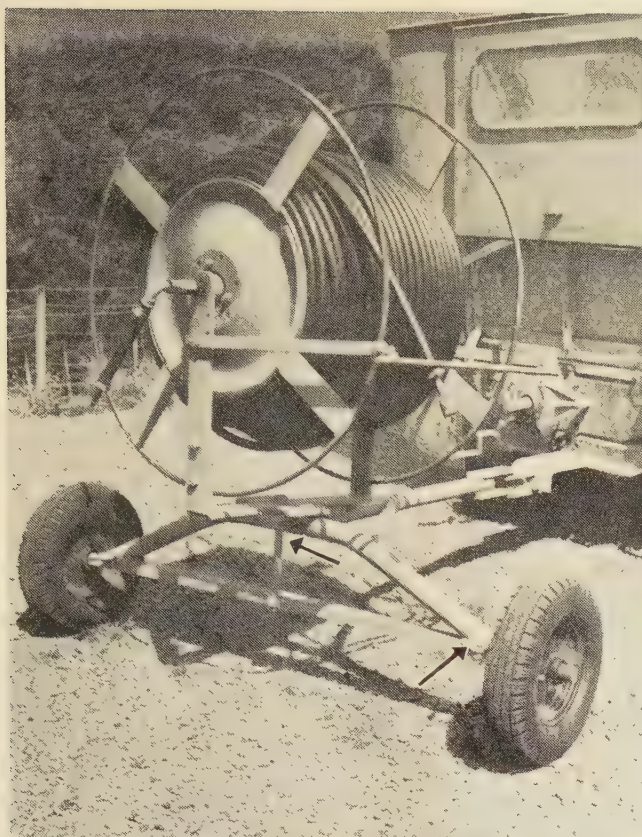
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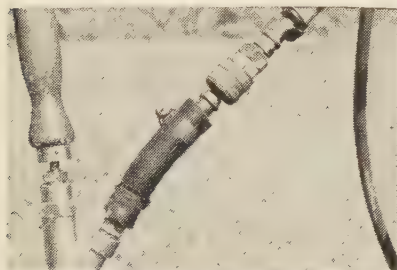
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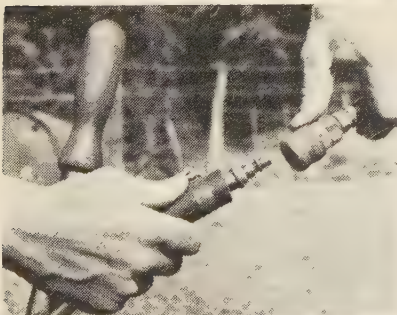
The reel in the towing position. When the plant is being towed the reel can be turned at 90 degrees (compare with illustration at right) and locked by a bolt through the base plate (see arrow). When on the job the reel trailer can be uncoupled and anchored by pegs driven through the rings adjacent to the wheels (see arrow). This means that when the towing vehicle goes to replenish the tank it need not be encumbered with the towed reel. The design ensures a minimum of moves, as the reel is free to move through 180 degrees on the base plate.

The hose is $\frac{1}{2}$ in. high pressure polythene piping made up to a total length of 400 ft. This length has proved ample on the job, giving only a 3 in. coiled layer on the drum, which permits easy rewinding. With the reel directed to the spraying operations the hose can be pulled out in readiness. Adjustment of the two tensioning nuts (indicated by arrows) beside the axle will prevent fast running, and the guide arm fitted between the two reel perimeters will prevent jamming. Once spraying is completed the tension can be let off and the hose reeled in by hand.



Snap Coupling

A twin cylinder pump adjustable up to 500 lb per sq. in. is used. With a pressure of about 260 lb per sq. in. commonly used, the $\frac{1}{2}$ in. hydraulic snap coupling is an invaluable link in this spray plant.



← The gun is shown coupled (left above) and the lower illustration shows how by gently pulling back the locking head with the thumb the gun can be slipped out and the union broken without either any loss of pressure along the hose line or any wastage of spray fluid.

With the gun so easily disconnected there is no risk of snagging in rough country while the hose is being reeled in and the extra trip to switch off the pump is done away with, as the pressure seal prevents leakage with the gun removed.

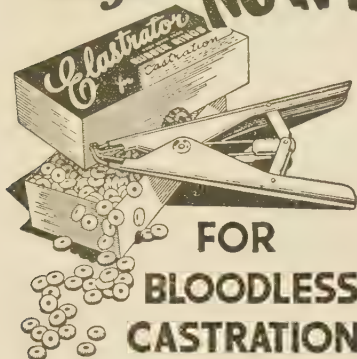
Suggestions

In the illustration of the reel at left above the nipple end of a snap coupling is shown on the short length of hose entering the centre of the drum. Some wastage is experienced at this point when the lead from the tank is disconnected to enable replenishing. By fitting the sealed head part of the union at this point wastage would be eliminated and the pressure retained in the hose.

The plant illustrated has the reel mounted directly above the rear axle. Experience over the season indicated that the reel would be better sited 6 in. forward of the rear axle, thus giving better road balance for travelling and greater stability on the hills.

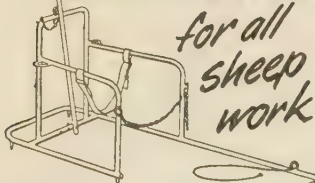
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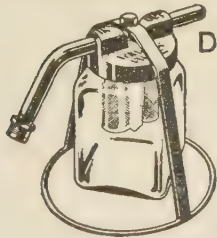
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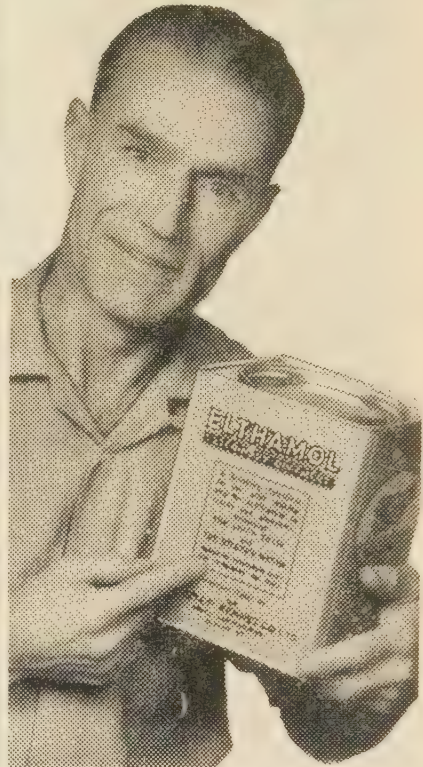


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Egg Production Severely Affected by Feeding Thiram-treated Wheat to Laying Birds

WHEAT treated with the seed protectant thiram (tetramethyl thiuram disulphide) fed in trials to pullets in full lay at the Department of Agriculture's Poultry Demonstration Plant, Upper Hutt, caused a rapid and spectacular drop in egg production. The treated wheat comprised 78 per cent of the ration and production dropped to 3 per cent in three days, returning to almost normal in less than a fortnight after feeding of the thiram-dressed seed was stopped.

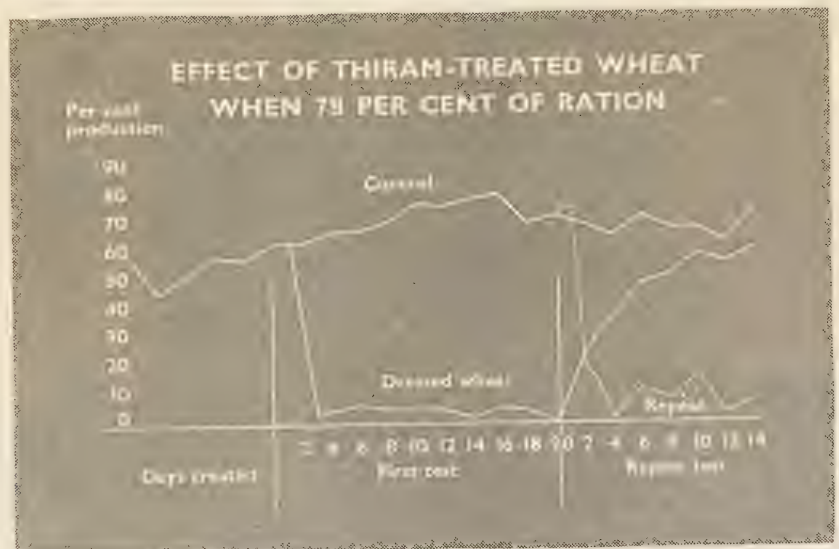
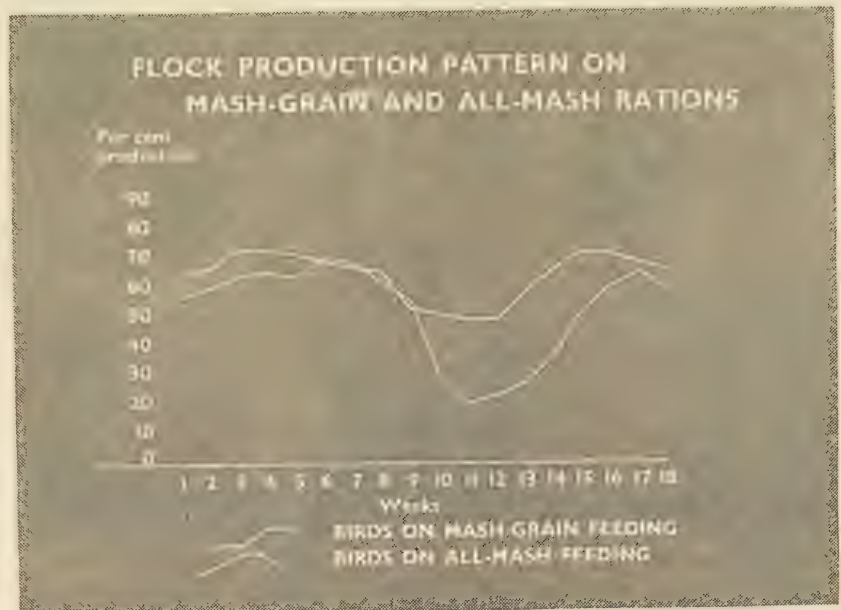
THE health of the laying birds appeared to be unaffected and a 57 per cent level of thiram-treated wheat in a ration fed to chickens five to 21 days old had no detrimental effect on body weight gain, food consumption, or health.

It is standard practice in New Zealand to apply a seed protectant to seed wheat and other seed grains before sowing and until recently it was usually an organic mercurial dust. Other types of seed protectants have now come on the market which have advantages over the organic mercurial types, and one, thiram, which might well be used more widely on seed grains in the future, has been used by the Department of Agriculture to treat seed wheat.

By **F. C. BOBBY**, Chief Advisory Officer (Poultry), Wellington, and **J. EDMONDSON**, Poultry Experimentalist, Upper Hutt, both of the Department of Agriculture

Surplus seed wheat which had been treated with thiram was used at the Poultry Demonstration Plant, Upper Hutt, in early July in feeding tests. Chickens about four weeks old were fed solely with thiram-treated wheat for four to five weeks. There were no deaths among the birds and they appeared in normal health at the end of the trial, so it seemed reasonable to consider that thiram-treated wheat was not harmful to poultry.

However, a much different result was obtained when ground wheat (one bag of thiram-treated wheat to one bag of normal wheat) was fed in laying mash.



Untreated wheat was fed only as a scratch feed. Birds on an all-mash ration received a higher level of thiram-treated wheat (22 per cent) than birds on mash and grain (13 per cent).

Egg production fell in most of the pens containing laying stock. The wet and cold July weather was at first blamed, but this was ruled out when a group of pens containing late hatched pullets which had just reached

a high peak of production showed a severe drop in production.

The birds appeared normal with all the usual signs of being in good production. This group of pens were being fed an all mash ration, which meant that they were receiving about twice as much thiram-treated wheat as the other birds which were on mash and grain.

The use of thiram-treated wheat was stopped after this result and a controlled feeding test was planned.

FEEDING THIRAM-TREATED WHEAT



Eggs with malformed shells laid by birds fed with thiram-treated seed (normal egg in centre).

Controlled Feeding Test

Four pens of Australorp pullets were used with 30 birds to a pen. A mash-grain diet was used, the mash being fed ad lib with a scratch feed of $1\frac{1}{2}$ oz of wheat per bird per day. Two pens were used as controls and two for measuring the effect of thiram-treated wheat.

Rations fed to both groups of birds were identical, with the exception that ground wheat used in the mash and also whole wheat fed as a scratch feed to two pens was thiram treated. The wheat used in the ration for both groups was 78 per cent of the total food.

Results of the feeding trial are shown in the charts. While the production of the control birds continued to rise the egg production of the thiram-fed birds made a spectacular drop as follows:

	Production
First day	63 per cent
Second day	28 per cent
Third day	3 per cent

Production remained at 5 per cent or lower until treatment was stopped after 20 days. The thiram-fed group were then given the control ration and a rapid rise in egg production resulted. A 50 per cent level of laying was reached in eight days and in 10 days the birds were close to the production level of the controls.

As a check a control pen was changed over to the thiram-treated wheat ration and an almost immediate

Department Aims to Broaden Advice on Animal Husbandry Problems

MR J. D. J. SCOTT, a field officer of the Department of Agriculture's Farm Advisory Division, has been appointed to the new position of Advisory Officer (Animal Husbandry). Mr Scott was seconded as a young Instructor in Agriculture to work at the Ruakura Animal Research Station, and during his five years there became well known to farmers, particularly as a lecturer at the annual farmers' conferences.

Pastoral and animal husbandry investigations in New Zealand have tended in the last 20 years to show an increasingly close relationship between soil and plant problems and animal thrift. Though Department of Agriculture field instruction has been developed to cope with this trend, Mr Scott's appointment is recognition of a need for a field service which meets even more closely the requirements of today's highly developed farming systems.

Mr Scott, who was associated with animal research officers and other specialists in important investigations at Ruakura, will maintain liaison between field officers of the Farm Advisory and Animal Industry Divisions and research establishments and will thus assist local officers to keep abreast of new developments in animal husbandry. Our farming efficiency

and serious decline in production resulted as shown on the chart.

During the 20 days of the trial the thiram-fed birds averaged 3.63 oz per bird per day, which was 0.73 oz less than the average for the controls. It is reasonable to conclude that this was due to the reduced requirements of the treated birds, as they were laying so few eggs.

A feature during treatment and after was the health of the birds. They appeared normal healthy birds in full lay and visited the nests as usual, but without laying. There was no sign of moulting. One bird died during the test, but from a control pen. Eggs from the group under thiram treatment were abnormal, some being misshapen and others were severely wrinkled or corrugated.

Young chickens were tested in specially designed cage brooders. A ration containing 57 per cent of thiram-treated wheat was fed to two cages of 25 chickens from five to 26 days old and the same number was kept as a control in two cages. There were no significant differences between the two groups in body weight, mortality, or food consumption. At the end of the test both groups were well feathered and appeared in good health.



Mr Scott.

depends on the use of properly tested methods of animal management and a readiness to adopt new procedures as soon as these are shown to be more effective. Advisory officers try to use new research information and adapt it to local conditions as quickly as possible and Mr Scott's work will be of great help in this direction.

TYPES OF FERN

MANY ferns are found in New Zealand grasslands, but the three most commonly occurring as serious weeds of hill country pastures are:

● **Bracken fern** (*Pteridium esculentum*). This fern is widespread throughout New Zealand and occurs from sea level to about 4,000 ft. It is a species confined to the Southern Hemisphere. The bracken fern of Britain (*Pteridium aquilinum*) is a very closely related species, and it can be confidently expected that the findings of the research work in Britain on the use of translocated herbicides (hormone weed-killers) on the control and elimination of bracken will apply to the problem in New Zealand.

● **Hard fern** (*Paesia scaberula*). This is also known as ring fern or carpet fern, terms which describe its mode of growth. This fern is frequently a serious weed in the higher rainfall areas.

● **Water fern** (*Histiopteris incisa*) which becomes a problem over a more limited range. It is sometimes known as sweet fern.



Good bracken fern control by sheep and breeding cows. The hard fern still persists, however.

FERN CONTROL

TO plan efficient and practical measures to control and eradicate fern a clear understanding of the mode of growth and reproduction is essential. Though the three species of fern under discussion (bracken fern, hard fern, and water fern) are fundamentally similar in their form and behaviour there are important differences which must be considered when control measures are being devised.

The experience of E. A. Clarke, who is Superintendent of the Whatawhata Hill Country Station, in controlling fern was outlined in a paper given by him to the Ruakura Farmers' Conference Week, an adaptation of which is given here.



Fern control under set stocking with sheep; the northern face only is clean. Stock compulsion is necessary by early weaning and mob stocking the ewes while the fronds are vulnerable.



Regular burning soon destroys the rich topsoil built up over the years under a cover of fern. Bare ground and not a sward of grass is the inevitable result.

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Bracken fern rapidly regenerating six weeks after an autumn burn. It has already reached a stage when it is not readily eaten by sheep or even cattle. The dense canopy is shading the young pasture.



On the surface only scattered small fronds are seen; underground the rhizomes are plentiful and healthy. The fern is in retreat, but by no means defeated.

BRACKEN FERN

THE fronds of bracken fern appearing above ground are a comparatively small part of the plant. In the soil lies a tangled mass of underground stems or rhizomes which may weigh up to 40 tons or more per acre. In a sample taken from 1 sq. yd. the fronds weighed 19.2 lb and the rhizomes and roots weighed 9.5 lb. On a per acre basis this is 41.4 tons of fronds and 20.5 tons of rhizomes and roots. In addition there was 75 tons of dead material on the ground.

These underground stems with fine fibrous roots branch in a most complex manner and in open soils may penetrate several feet. The more fertile and open soils support a deep and dense mass of these rhizomes. The rhizomes nearer the surface give rise at their numerous growing tips to several new fronds each year.

Though the fronds persist usually for only one season, such a profusion of new fronds is produced each year that a canopy of fern is maintained which shades out the grasses and clovers. This frond production may begin in late November and continue until the end of May.

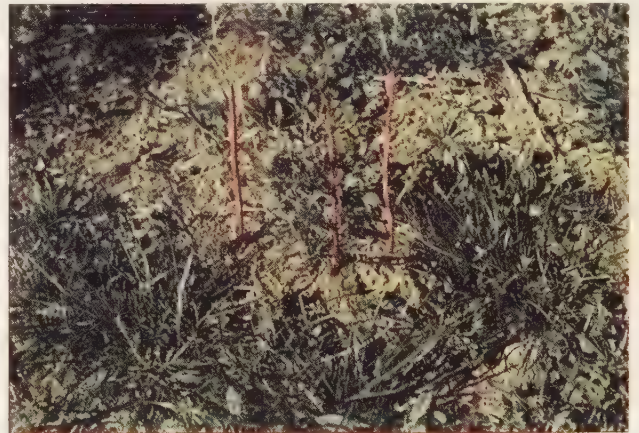
The shallow frond-producing rhizomes are less fleshy and slower growing than the deeper rhizomes. The latter, thick and fleshy with reserves of starch, grow outward much more rapidly and are mainly responsible for the spread of the plant. They are frequently found up to 6 ft from the nearest fronds and eventually give rise to fronds and shallower frond-producing rhizomes. In this way a small clump of fern soon presents a broad front advancing at the rate of several feet a year.

In heavy clay soils and soils of low fertility the rhizomes are shallower,

slower growing, and less fleshy, and give rise to fewer and less vigorous fronds.

The big reserves of plant food stored in the rhizome serve not only to tide the plant over winter but to survive complete defoliation by burning and defoliation by grazing and tramping over many years. The shallower rhizomes are frequently damaged by fire and trampling by stock, but the deeper layers are uninjured and quickly regenerate fronds to recommence the synthesis of plant food reserves and rhizomes to store them.

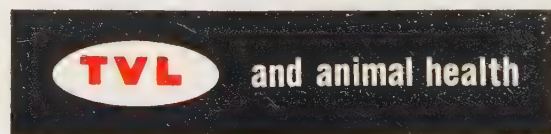
Living rhizomes of bracken under pasture were recently observed where frond production had not been permitted for four years. It is possible that the survival time could be even longer than this. Certainly where some frond production is permitted the life of the plant might be extended indefinitely. It is clear that eradication by defolia-



The fronds in the curl are soft and palatable. This is the time to attack. The growing point is at the tip and very vulnerable. Once the frond has opened it becomes a functional leaf, hard, unpalatable, and actually regenerating the underground stems and building starch reserves. The tips of nearly fully mature fronds may be somewhat soft, but at this stage their removal does not destroy the frond.



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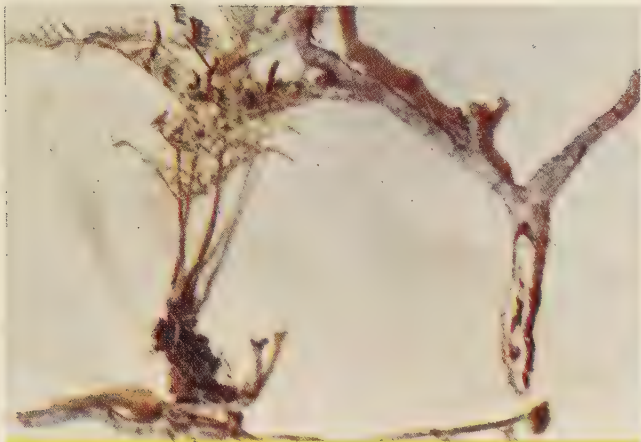
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The rhizomes are underground stems stored with starch reserves, which tide the plant over long periods of defoliation. There may still be many tons per acre underground when little is left of the fronds above ground.



If the weather is favourable, a clean burn of hard fern can be achieved, no "ring" being left. On the right an unburnt fringe is seen. The ash should be topdressed and oversown immediately.

tion can be achieved only over a long period and only then where defoliation has been efficiently carried out.

The fronds are most vulnerable in the early stages of growth (up to 6 in.), when they are readily broken off by trampling or eaten by stock. Once the growing point at the tip of the frond has been removed its growth ceases.

Efficient control, therefore, should aim at defoliation while the fronds are young and tender. However it must be realised that frond production may be continuous from November to May. If reasonably complete defoliation is achieved each year, frond production is greatly reduced in each successive year until finally the rhizomes are depleted of food reserves and the plant dies.

Bracken not only reproduces vegetatively but also from spores which are produced on the under sides of the mature fronds toward the end of summer. These spores are carried by the wind and in damp, shady places may germinate to produce small, flat, green plants about the size of a white clover leaflet.

These plants produce sexual reproductive organs which produce an embryo fern. This is small and delicate in the first year, with little or no food reserves, and is very readily damaged by stock. These embryo ferns are seldom found in grassland, but mainly in protected and damp locations such as under logs or on the edge of bush. Bracken spreads in grassland mainly by the growth of the rhizomes of established plants.

Control of Bracken Fern

1. Weedkillers

Many weedkillers, if applied at sufficiently high rates, will kill the foliage of bracken. Sodium chlorate and arsenic pentoxide have been used for this purpose. At heavy rates (170 lb

per acre) sodium chlorate will have a marked effect on the rhizomes also, but the deeper rhizomes are relatively unaffected. In addition all other vegetation is destroyed.

These facts coupled with the high cost of application under New Zealand hill country conditions make such methods quite impracticable. Trials in Britain with "hormone weedkillers" are said to be giving promising results. However, there is no efficient method of eradication yet using any known weedkiller, though there are some which give a measure of control.

2. Burning

If suitable weather is chosen, fern can be burnt off at almost any time of

the year. Burning, however, does little real damage to the bracken fern, since the underground stems are comparatively unharmed. The fronds, which are all that are damaged by the fire, live usually for only a season and are replaced by new fronds from November to May.

Burning is therefore only a first step in fern eradication and should be followed immediately by sowing, topdressing, and measures to deal with the inevitable crop of new fronds. Grass establishment is impossible in the shade of a dense cover of fern, and burning is the cheapest, quickest, and most effective way of removing this cover.

The ash from the burn provides a temporary but rich surface layer to assist in grass establishment but lacks consolidation and washes away readily. Sowing should therefore follow the burn immediately. Burning in autumn generally favours best the successful establishment of grass and clovers, because weather is generally more favourable. A dry spell after sowing is particularly serious when the seedbed is largely composed of loose ash. A sequence of heavy rain which washes away the loose ash, exposing the shallow roots of the very young plants, followed by a hot, dry spell can completely spoil the establishment of the pasture. Autumn burning and sowing have the further advantage that new frond development is less vigorous and ceases in winter, so that control measures are unnecessary until the following summer, when the pasture is well established and able to stand up to hard grazing.

Burning and sowing in spring are often successful if carried out early enough to enable good establishment of the pasture before vigorous control measures become necessary against the summer frond production. After



Hard fern or ring fern has a thin, wiry rhizome on the surface which is easily destroyed by fire.



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winter the mass of dead fronds burn readily after a short spell of fine weather. It is generally held, however, that weed establishment is greater in spring sown pastures.

Regular burning to control fern is an inefficient and a short sighted policy. It results in destruction and loss of the topsoil and in the dominance of the more fire-resistant and much less productive pasture species. It achieves little in the eradication of fern except, over a long term, the gradual decline of all vegetation through the fall in soil fertility.

3. Topdressing

Topdressing by itself does not eradicate fern, but improves the vigour of its growth. It contributes, however, to fern eradication in several ways. Topdressing almost invariably seems to improve the palatability of bracken fern to the grazing animal and it is frequently observed that both sheep and cattle at times preferentially graze the young fern fronds on topdressed country though grass may be plentiful. Possibly the fern is an attractive alternative to lush pasture.

Topdressing by raising the carrying capacity greatly assists fern control by increasing that concentration of mouths and hooves which is so essential to control frond production.

In the course of a few years under even a modest topdressing programme marked fern control has been achieved without much conscious management effort having been directed to this end. Such experience I believe gives rise to the widely held belief that fern does not tolerate topdressing. Where management is intelligently directed to maximum fern control, results are truly spectacular. Topdressing is but one important factor in fern control and eradication.

4. Stock Management

The grazing animal has always been regarded as the prime factor in fern control. The aim should be the continued weakening of the underground stems and depletion of the immense starch reserves by constant defoliation. This is achieved most efficiently if the young fronds are never allowed to reach the stage when they become functional leaves, using the energy from sunlight to elaborate the relatively simple substances passed up from the roots into complex compounds to be built into plant tissues and to be stored as starch in the rhizomes.

In the early stages growth of the frond is supported by the stored plant reserves and constant defoliation at this stage gradually depletes these reserves with consequent reduction in frond production and growth of the underground stems.

If defoliation is efficient for a few years, the plant gradually dies, its tissues making a substantial contribu-

tion to soil fertility. In the early stages of growth the fronds are soft, palatable to stock, and easily damaged. Fortunately, too, the removal of the tips, where the growing points are located, immediately destroys the fronds.

The use of livestock, usually cattle, to remove mature foliage contributes little to the eradication of fern. The mature foliage has already contributed something to the rejuvenation of the plant and much will die in any case before the following spring. Its removal to let light into the sward is essential, but the aim, once having achieved this, should be to prevent its recurrence. Its removal again and again by stock is both costly and inefficient.

The initial removal of foliage, especially when the cover is dense, is better achieved by fire than by taking heavy cattle to the point of emaciation. Young cattle under two years of age are comparatively useless for this purpose. They do poorly on a diet in which fern is an important constituent and inevitably have to be removed before the job is nearly completed. Likewise sheep are useless. In the early stages of fern growth, however, young cattle and sheep are prime factors in its control.

The time of the year when frond production is beginning coincides usually with the period of maximum pasture production, so that the fundamental problem is the provision of the maximum number of mouths and hooves to achieve good feed utilisation and so good fern control.

This condition is most nearly met when the maximum number of breeding stock and the minimum of store stock are wintered, so that the natural increase is maximum. It is better, too, to aim at slight overstocking, since though production per ewe may fall slightly, production per acre will be increased.

In brief, the slightly lighter sheep has a lower maintenance requirement and, in addition, recent research indicates that at a lower intake, feed consumed, both in terms of protein and energy, is more efficiently utilised. Of great importance, however, is the far better utilisation of feed produced by a thrifty, agile animal in good store condition.

Maximum control by stock is more nearly achieved by modification of some aspects of stock management:

(i) **Sheep:** The early weaning of lambs in late November (at about 12 weeks of age) enables the ewes to be mob grazed to achieve rapid and complete utilisation of feed and maximum fern control by grazing and trampling in those paddocks where fern control is most needed.

. . . CONTROL OF BRACKEN FERN

Moves of sheep and cattle should be planned well in advance so that paddocks comparatively free or free of fern are shut up to provide weaning feed for lambs, and paddocks needing fern control are the barest by weaning time. In 1954 I discussed the advantages of early weaning on hill country at this meeting and subsequent experience has served only to confirm the views expressed on that occasion.

Where best possible provision is made for early weaned lambs they do better than late weaned. When poor provision is made they may do slightly poorer, but by January, when late weaning is usually carried out, the maximum difference in live weight seldom reaches 4 lb. Usually late weaned lambs are no heavier than early weaned.

At the Hill Station for some years weaning and shearing of both ewes and lambs have been carried out in late November with very pleasing results and greatly increased efficiency in fern control. Weaned ewes in large mobs or preferably in one large mob rapidly clean out a paddock of grass and young fern fronds without compulsion and consequent loss of condition.

(ii) **Cattle:** We must look forward to the day when weaner steers and surplus weaner heifers from the hill country herds will all be finished into quality lightweight beef on suitable country and none be subjected to severe store periods and turned only into aged heavy frozen beef.

Tradition dies hard, however, and it is still widely held that hill country must be bashed into shape by heavy cattle. This annual crushing of the same fern area makes for slow progress. It is tackling the problem at the end instead of at the beginning. Fern must be nipped in the bud literally, and to achieve this cows and not steers are the more efficient.

The breeding herd today can return a gross income seldom less than £15 per head and often approximating £20. A more rational management enables full use to be made of its potential as a hill country implement.

Briefly the breeding season must be restricted and we have found that with the bulls out from November to January the calving percentage has not fallen. With the calves weaned at the end of January at an average age of four and a half months the cows are worked harder in assisting the ewes in fern control. As the tugging season approaches the work of the ewes, which must be now flushed, is taken over by the cows and the ewes play only a minor role.

The early weaning of calves does not mean inferior weaners and yearlings if foresight is used to prepare

for early weaning. Indeed in a bad season early weaning eliminates competition between cow and calf for available feed. Where no provision is made for early weaning and management is slack, early weaned calves can be up to 40 lb lighter at 12 months of age. Even under these conditions there is no effect at two years, when the heifers are mated.

Pregnancy diagnosis carried out in March or April enables the dry cows to be picked out and managed separately. The in-calf cow can be worked and kept in hard store condition until late June, and if picked up slightly now with a small supplement of hay, crop, or autumn-saved grass, calves down without trouble and rears a good calf. The extra mouths in spring aid in meeting the problems of full utilisation and control of fern.

I have tried to point the ideal to aim at. Needless to say it cannot always be achieved, especially where the fern problem is widespread over the farm. However, I am certain from my own experience and what I have observed that where this ideal is the aim, progress is most rapid. As the back of the problem is broken the ideal becomes attainable; then indeed progress is amazingly rapid.

Bracken Fern Poisoning

Bracken fern poisoning rarely affects sheep or horses and is uncommon in cattle. It may occur sporadically in cattle of all ages which have been grazing on fern country for some months, and sometimes occurs after the stock have been removed. It is fortunate that this disease is rare, since the cause in cattle is not clearly understood, there is no specific treatment, and affected animals seldom recover.

HARD FERN

Hard fern has a shallow rhizome easily damaged by fire. It is not grazed by stock at any stage of growth and is thus seldom subject to hoof damage. It grows as a dense carpet, shading out grasses and clovers, so that there is little or nothing to attract the stock. It grows in circular clumps up to 10 ft across. These arise from the outward spread of the fern from a parent plant and adjacent clumps may coalesce. It sometimes dies out from the centre, giving rise to the name ring fern. The ring may also rise from an unburnt fringe. The rhizome is hard and wiry and much branched, but with small reserves of starch compared with the bracken fern.

It is best controlled by burning and oversowing in a dry autumn, but since it flourishes best in high rainfall areas (over 50 in.) it is difficult to burn cleanly except in favourable seasons. It is more winter hardy than bracken fern but can often be successfully burnt in spring. Since the rhizome is on the surface, burning usually com-

pletely destroys the plant, though a fringe is commonly left which spreads in due course, but slowly.

Spraying with a weedkiller such as arsenic pentoxide has often assisted in obtaining a clean burn in a very wet climate. At the Hill Station burning in autumn has almost completely eliminated this fern. New plants from spores frequently arise in the shade of fallen logs.

Summary

1. Bracken fern spreads mainly by outward growth of much branched underground stems or rhizomes.
2. These rhizomes also store big reserves of starch which tide the plant over long periods of defoliation.
3. These rhizomes are not susceptible to damage by fire or trampling and from them arise new fronds from November to May.
4. The young fronds with the growing point located at the tip are tender, palatable, and easily damaged.
5. Mature fronds elaborate plant foods for growth and storage and usually live for only one season.
6. Control should aim at preventing the fronds from maturing, thus depleting stored reserves.
7. Fire serves to remove the canopy above ground to enable pasture to be established, and is only a first step in eradication.
8. The maximum number of female stock should be wintered so that the natural increase in spring assists in fullest utilisation of feed grown and maximum control of fern.
9. Modification of standard stock management practices, particularly early weaning, assists in fern control.
10. Hard fern and water fern have shallow rhizomes easily damaged by fire, which simplifies their eradication.

WATER FERN

Water fern with its pale celery coloured leaf is a rampant grower on banks and shady places, but is seldom of much importance on grassland. It is sometimes well established on light country on shady, cold, and wet faces.

The rhizome is again shallow and easily damaged by fire. It is not eaten by stock at any stage of growth.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during August 1960 with comparative figures for the same month of 1959 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER						
Month					Percentage increase	
August 1960	..	..	..	Creamery (tons)	12,300	12,471
August 1959	..	..	..	Whey (tons)	10,536	10,670
Increase	..	..	..		+1,764	+1,801
Butter in store at 31 August 1960 was 10,356 tons						+16.879

CHEESE						
Month					Percentage increase	
August 1960	..	..	..	White (tons)	2,870	3,024
August 1959	..	..	..	Coloured (tons)	1,926	1,982
Increase	..	..	..		+944	+1,042
Cheese in store at 31 August 1960 was 5,442 tons						+52.57

If these figures are converted into butterfat equivalent, there is an increase of 19.636 per cent in butterfat graded for the month as compared with the same month as the preceding season. The above figures refer only to butter and cheese graded for export and do not include butter and cheese used on the local market and other products such as anhydrous milk fat, whole milk powder, and other whole milk products, and are not necessarily a true indication of production trends.



Vegetable Growing for HOME and MARKET GARDENERS

Developments in Growing Glasshouse Tomatoes

[Sparrow

By I. G. FORBES,
Assistant Horticultural Superintendent, Department of Agriculture,
Dunedin

DURING the last 10 years the total area of tomato glasshouses in New Zealand has grown to some 10 million sq. ft. and at the same time yields have increased. In 1950 the estimated average yield was 36 tons per acre. Today the estimate is nearly 48 tons per acre. Many growers expect 60 tons per acre regularly and some attain 80 or 90 tons per acre in favourable seasons. There has been some concern that production is outstripping demand. If this trend continues, prices will become uneconomic for the less efficient producers and fruit quality could become increasingly important.

STRICT attention to glasshouse hygiene coupled with better pest and disease control has been of considerable importance in achieving higher yields more regularly, but there have also been advances in glasshouse design and crop management.

Advances overseas in both science or practice have been speedily tried

out in New Zealand and there has been good liaison between growers, scientists, advisory officers, and commercial firms.

Soil Sterilisation

Chemical sterilisation with chloropicrin is the most popular method of soil sterilisation. DD is used on its own or in conjunction with chloro-

picrin if eelworms are present. Plant Diseases Division, Department of Scientific and Industrial Research, Auckland, and Cawthron Institute in Nelson are continuing to study newer materials as they become available. F. J. Newhook, of Plant Diseases Division, recently drew attention to the need for using 1:49 formalin solution in place of water as a seal when using chloropicrin and this practice has become widely accepted.

Soil temperatures below 55 degrees F cause difficulties with chemical soil sterilisation in many districts, and near Oamaru these difficulties appear to be accentuated by the nature of the so called "tarry soils" on which a number of glasshouses are situated. At Levin soil temperatures can be below 55 degrees by mid May. In southern areas container growing of plants and re-soiling are favoured, though the supply of soil available for re-soiling is limited and the labour requirement is heavy.

Eelworms are causing increasing concern, particularly where chloro-



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Rogor 40 combines a systemic action, which remains persistent in the plant, with a quick knockdown action at the time of spraying.

wide range

Rogor 40 controls a wide range of pests, including spidermites, aphids, mealybugs, leaf hoppers, leafminers and certain scale insects.

Supplies and information from The Canterbury (N.Z.) Seed Co. Ltd., 208 Cashel Street, Christchurch.

Rogor 40 may also be obtained from your local branch of The New Zealand Fruitgrowers' Federation and from J. H. Barbour and Son Ltd., 66 Vivian Street, Wellington.

FISONS



CONTROL

DEVELOPMENTS IN GROWING GLASSHOUSE TOMATOES



[Sparrow

▲ This fine glasshouse is typical of many built in the Auckland area in the last 10 years.

▼ In houses built recently more use is being made of steel trusses to obviate the need for centre posts and so leave the floor free of obstructions.



picrin has been used regularly. Fumigation with methyl bromide at 1 to 2 lb per 100 sq. ft. under plastic sheets is being advocated where fungous diseases such as verticillium wilt are not a serious problem. Some growers adopt the practice of using chloropicrin fumigation one year and methyl bromide fumigation the next.

Vapam, one of several new chemical soil sterilants that have appeared in the last year or two, has been tried by a number of growers. It gives good weed control and plants make copious root growth. Difficulty has been experienced in getting rid of the fumigant from the soil and plant damage has occurred on hot days for some

months. Further experience with this material is necessary.

The cost of steam disinfection is now about double that of sterilising with chloropicrin, but increasing trouble with soilborne tobacco mosaic virus is causing many glasshouse tomato growers to consider steaming of their soils.

Glasshouse Hygiene

Not only is it important to sterilise the soil before planting but also to give strict attention to prevention of carry-over of disease from one season to the next by removal of plant remains and strings and by washing down the

glasshouses with copious amounts of soapy water or 2 per cent formaldehyde solution.

Attention has recently been drawn to the many ways in which tobacco mosaic may be introduced into glasshouse tomatoes. The virus is long lived, highly infectious, and very resistant to heat and chemicals. Seedling boxes, soil, implements, overhead wires, the glasshouse structure, strings, plant remains, and workers' hands and clothing may all be implicated in the carryover or introduction of the disease. The virus is also seedborne and acid extraction of seed is recommended. Plants may be affected with tobacco mosaic without showing obvious symptoms.

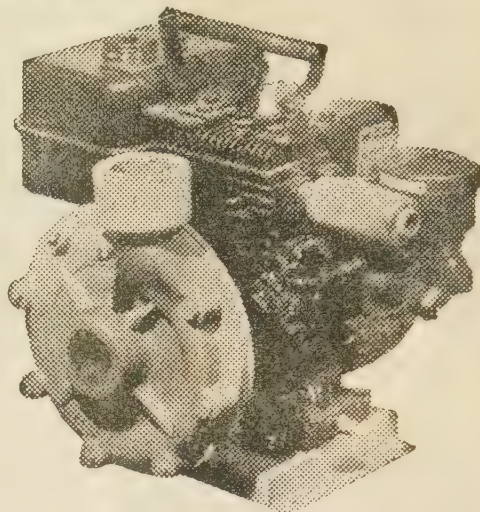
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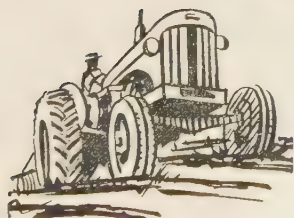
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The value of strict glasshouse hygiene has been emphasised in Nelson in the last few years in dealing with the soilborne fungus *Didymella lycopersici*. Trials by Plant Diseases Division and Horticulture Division officers showed the value of regular protective sprays of captan at 5 lb per 100 gallons associated with rigorous hygiene in keeping this disease within bounds.

Newer Therapeutants, Improved Application Methods

In recent years the carbamate fungicides have come into wide use and use of the copper fungicides has declined. Better equipment for applying therapeutants in glasshouses, particularly the development of paint spray equipment, has assisted in pest and disease control. Ventilation and good growing conditions are also important.

The main therapeutants in use at present are **zineb**, particularly when used in paint spray equipment, against leaf mould and late blight; **thiram** against botrytis; **ferbam**, used extensively against botrytis in conjunction with hormone fruit-setting sprays; and **dichlone** against leaf mould.

The swing away from copper fungicides appears to have resulted in greater incidence of bacterial diseases in some localities and this is causing concern.

Varietal resistance to pests and diseases is being studied by the Crop Research Division and the Plant Diseases Division. The resistance of some varieties to leaf mould (*Cladosporium fulvum*) is well known. A number introduced into New Zealand were resistant to some strains of *Cladosporium*, but the development of new strains of the fungus has led to breakdown of resistance in some varieties, such as Vetomold and Improved Bay State. V-548, the most recent leaf mould-resistant variety, so far appears to be maintaining its resistance. Work is progressing in New Zealand in breeding commercially acceptable varieties resistant to spotted wilt and tobacco mosaic viruses.

Soil Preparation

Advisory officers continue to stress the need for liberal applications of compost or peat or for green cropping. Increasing rotary cultivation of glasshouse soils makes additions of organic matter all the more necessary for the maintenance of good soil tilth. On the lighter, free-draining soils organic matter is required to improve water-holding capacity, particularly where trickle irrigation is used and the spread of water in the soil is limited by rapid drainage.

Good drainage is also very necessary. On areas where subsoil moisture is a problem and drainage is possible

the isolation of the glasshouse soil from subsoil moisture by a tile drain is advocated.

Crop Management

To attain high yields of good fruit the tomato grower tries to maintain a balance between vegetative growth and the development of flowers and fruit. The aim is to have plants with moderately dark green leaves and average-sized stems of even diameter carrying eight to 10 well set trusses below the wires. Flowers should be bright yellow and fruit smooth, medium sized, and evenly coloured. In general, plants should set one, or at the most two, trusses at a time rather than have fruit set unevenly over three or four trusses.

Scientific investigation both by plant physiologists with "growth control chambers" and by experimentalists with commercial-type glasshouses is explaining how such things as light, temperatures by day and night, carbon dioxide concentration, soil moisture, plant nutrients, and relative humidity influence tomato plant behaviour. Growers can control some of these factors, such as soil moisture and plant nutrients, better than others such as light, carbon dioxide concentration, and temperatures, though heating and ventilation can smooth out temperature variations to some extent.

Varieties differ in their requirements. It is very important to choose varieties adapted to the general growing conditions in a particular locality. Potentate variety has proved to be adapted to most glasshouse production areas in New Zealand. Plant breeding could conceivably produce varieties better adapted to New Zealand conditions, but at present there are no facilities to carry out this work.

Soil Analysis

Greater use is now being made of soil analysis as a guide to soil preparation and fertiliser application. K. J. McNaught, Principal Scientific Officer, Department of Agriculture Rukuhia Soil Research Station, has developed this work within the Department in association with Horticulture Division instructors.

Phosphorus

The development of trickle irrigation and liquid feeding has caused a reappraisal of glasshouse fertiliser practice and is one reason why soil chemists in England have queried the necessity for continued application of phosphatic fertiliser in tomato glasshouses where soil analysis shows very high soil phosphorus levels. However, McNaught has found that leaf analyses of plants grown on soils with a high test for phosphorus are usually normal, and sometimes quite low. In view of the misleading soil phosphorus tests

. . . GROWING GLASSHOUSE TOMATOES

which can result where large quantities of bone fertiliser have been used or (as in some South Island soils) minerals such as apatite are present, some caution is needed in interpreting high tests for phosphorus.

Uptake of phosphorus from the soil appears to be influenced markedly by soil temperatures, being low at lower temperatures. Crops planted in cold periods of the year may thus require added phosphatic fertiliser whereas crops planted in similar soil during warmer weather may not. It appears that, in the main, phosphatic fertiliser can be applied in the base dressing and supplementary feeds can be confined to dressings of nitrogen and potash.

Potassium

The soil potash test is considered to give a good indication of the potassium supply. The aim is usually to keep the soil potash test moderately high, but not excessively so. Quite a lot of the potassium detected by the soil test is water soluble and thus can be leached from the soil by flooding.

Nitrogen

In ordinary soil analysis carried out for growers no test is done for soil nitrogen, either in the nitrate or ammonium form. Both forms are readily leached from the soil, but some remains even after flooding. Bolting of plants and poor bottom trusses are often ascribed to excess nitrogen in the base fertiliser. High night temperatures can also aggravate this trouble.

There is growing caution in the use of nitrogen in base fertilisers, particularly where the soil has been sterilised with steam. Even bonedust might, under some circumstances, supply more nitrogen than is needed.

Magnesium

Symptoms of magnesium deficiency are seen quite frequently on glasshouse tomato plants. Heavy applications of potash fertiliser are often associated with magnesium deficiency and sometimes low pH (high soil acidity). The symptoms are characteristic: First, yellowing of the lower leaves; then in time more widespread and intense yellowing of leaves.

For crops which receive about 1 ton per acre of potash fertiliser 2 tons per acre of Epsom salt (magnesium sulphate) may be required to correct magnesium deficiency. The most economical treatment of glasshouse tomatoes is by spraying three to five times at fortnightly intervals with a 2 per cent Epsom salt solution plus a spreader. A fine spray should be used and the applications begun after first flowering.

This may use 3 to 6 cwt of Epsom salt to the acre of ground area instead

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of perhaps 1 to 2 tons when applied to the soil.

The use of serpentine superphosphate in place of superphosphate can be recommended on any but high-magnesium soils for long-term production of glasshouse tomatoes.

Soluble Salts

Since McNaught's work on soluble-salt injury in glasshouse tomatoes has become well known, fewer crops showing the typical hard-foliaged, thin-stemmed, poor cropping plants associated with this condition are seen. Soil analysis for soluble salts and flooding to leach out the salts in winter enable most growers to keep soluble salt concentrations within allowable limits.

On poorly drained soils leaching of soluble salts may not be possible and growers have to adopt a practice of "wet regime" growing. A moderate quantity of salts is desirable to restrain vegetative growth and encourage fruiting. There is some doubt as to whether this should be brought about by reduced watering or less thorough flooding or by heavier base dressings of fertilisers after heavier flooding.

Watering

English workers have shown that in growing glasshouse tomatoes it seems desirable under good growing conditions to keep the soil moisture fairly close to field capacity. This means that the soil should be holding as much water as it can against the pull of drainage. The most accurate methods of determining soil moisture content are laboratory procedures not adapted to the needs of commercial growers.

The soil moisture tensiometer is being used by a number of growers. The instrument consists of a water-filled porous ceramic pot, fitted to a central connecting tube and a vacuum gauge reading in centimetres of mercury. If the porous pot is put in the zone of maximum root activity and the instrument is properly installed and maintained, it can give a good guide as to when to water. Some experience is required, however, in deciding how much water to apply, because it takes some time for the instruments to record a steady reading after water has been applied to the soil.

Two or preferably three tensiometers should be installed in each house to reduce possible errors. Readings of about two or three on the tensiometer scale can be taken to mean that the soil moisture content is close to field capacity.

Tensiometers function best at moisture tensions not exceeding 25 centimetres of mercury. Excavation of roots at the end of a season would give a guide to the best place to install tensiometers.

GROWING GLASSHOUSE TOMATOES



Trickle irrigation equipment used in trials at the Horticultural Research Station, Levin.

Trickle Irrigation and Liquid Feeding

Trickle irrigation systems give growers a means of saving time and labour in watering and feeding their plants as well as controlling more readily the quantities of water and nutrients applied. The most popular system in New Zealand was introduced about 1953 and consists of a rubber or plastic hose running along the rows of plants with a metal nozzle which allows water or nutrient solution to drip out at about 2 pints per hour at the base of each plant.

Nutrients are supplied to the system by charge diluter bottles into which some of the flow of water is led to displace an equal volume of nutrient solution. Some provision is

made for altering the concentration at which the solution is fed.

Many growers have built their own systems, and in some the nutrients are applied by dissolving the required quantity in a tank of water which is then fed to the plants through the trickle system, or whatever means is used to distribute the liquid. In adapting trickle irrigation and liquid feeding techniques to New Zealand practice growers have relied very largely on English experience and recommendations.

Fertilisers Used for Liquid Feeds

Water-soluble fertilisers are required; potassium nitrate (13 to 14 per cent nitrogen and 42 to 47 per cent



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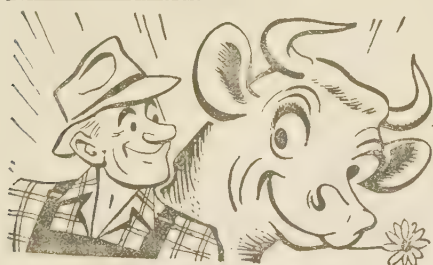
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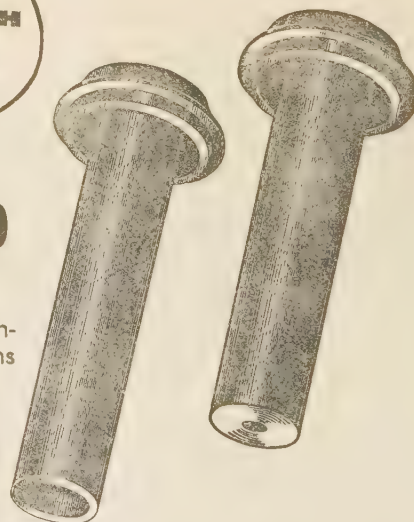
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potassium oxide) has been the basis of English recommendations. On its own it provides too much potash and not enough nitrogen. Accordingly ammonium nitrate (34.5 per cent nitrogen), urea (45 per cent nitrogen), or sulphate of ammonia (20.6 per cent nitrogen) are added to bring the nitrogen:potash ratio within the following range 1:3, 1:2, 1:1, 3:1.

Phosphate is normally supplied in the base dressing, though some proprietary water-soluble fertilisers are available which contain phosphate as well as nitrogen and potash.

Following English practice, growers usually begin watering with solutions low in nitrogen and high in potash (1:3 or 1:2) and to increase the proportion of nitrogen as the season progresses and the intensity of sunlight increases. Early in the season, when small quantities of water are applied, concentrated solutions are used; for example, 1 part of concentrate to 100 parts of irrigation water. As the water requirement increases more dilute solutions are given (1:300, 1:500, or 1:1,000 depending on seasonal conditions).

For much of the season feeds containing equal parts of nitrogen and potash have been widely used, though some English recommendations advocate one part of nitrogen to two parts of potash for the main feeds. Higher light intensity and apparently higher water requirements in New Zealand could make it advisable to use correspondingly weaker solutions to avoid excessive fertiliser applications.

Making up Feeds

The composition of liquid feeds is usually expressed as pounds of nutrient nitrogen (N) or potash (K_2O) in 10 gallons (100 lb) of water. The amounts of ammonium nitrate and potassium nitrate to make up various liquid feeds which are equivalent in composition to commercial products are shown in the accompanying table.

	N	K_2O	Ammonium nitrate	Potassium nitrate	Water
	per cent	per cent	lb	lb	gal.
(1)	4.5	9.0	5.5	19.0	10
(2)	9.7	8.3	21.0	18.0	10
(3)	20.0	7.0	52.0	15.0	10

When using urea and potassium nitrate to make a feed equivalent to (2) above dissolve 16 lb of non-coated urea (46 per cent N) and 18 lb of potassium nitrate in 10 gallons of water.

If sulphate of ammonia and potassium nitrate are to be used, a concentrate only one third the strength of those with either ammonium nitrate or urea and potassium nitrate should be prepared, because potassium sulphate which has low solubility, is formed. To compensate for the lower strength of concentrate the feed actually supplied to the plants has to be three times as strong.

A detailed article on the preparation and use of home-made liquid feeds for trickle-irrigated glasshouse tomatoes will be published in the December issue.

Trials at Levin Research Station

For the past four years experiments at the Horticultural Research Station, Levin, have sought information on trickle irrigation and liquid feeding under New Zealand conditions and compared this method with traditional methods of feeding and watering.

1. Comparison of methods of applying water and nutrients

One series of experiments compared trickle irrigation and liquid feeds with measured bucket watering and conventional applications of dry fertiliser side dressings. Measured bucket watering was used instead of a hose to ensure accurate application of water. The same base dressing of fertilisers was applied to all plots.

In three years' trials in an unheated glasshouse at Levin there was no difference in yield of plants fed and watered by the two different methods.

In these trials soil moisture tensiometers were used to indicate when water or liquid feed was to be applied. The tensions were 25 to 30 cm for bucket watered treatments and 10 cm for trickle treatments. Similar quantities of water were used overall in the two watering treatments, the average seasonal requirement being 30 gallons per plant. The actual requirement varied with the number of hours of bright sunshine as shown below:

Season	Bright sunshine hours	Water requirement per plant gal.
1956-57 ..	1,232	35
1957-58 ..	990	26
1958-59 ..	1,056	30

Most of the season between 1 and 3 pints per plant per day of liquid feed were given in trickle treatments, and bucket waterings were given every three or four days. Side dressings were applied fortnightly.

2. Concentration of fertilisers

In the first year of the trials fertilisers were applied at two rates through the liquid feed. One rate (normal) was based on English recommendations; the other was half that rate (half-normal). The second year two rates were again used, normal and twice-normal.

No differences in yields of marketable fruit were obtained with any of the rates.

Higher concentrations of liquid feeds tended to reduce the percentage of blotchy-ripened fruit, but there was not a high incidence of this condition in any year.

... GLASSHOUSE TOMATOES

The range of concentrations used varied from 1 part of fertiliser solution to 150 parts of irrigation water to 1:500 in one trickle treatment, and from 1:300 to 1:1,000 in the other during the first season, in which sunshine hours and the amounts of water applied were the greatest. Narrower ranges were used in the other seasons.

3. Rates of nitrogen to potassium

Experience at the Horticultural Research Station suggests that the use of a solution with an approximate N: K_2O ratio of 2:2 appears to be warranted in New Zealand, at least for unheated glasshouses planted in August as used in these trials. The main fertiliser solution used contained 9.7 per cent of N and 8.3 per cent of K_2O .

4. Is it necessary to change the composition and concentration of liquid feeds?

Experience at the Horticultural Research Station over the past two seasons suggests that it is not necessary to change the composition and concentration of liquid feeds for crops grown under conditions similar to those at Levin. Differences in yield were very slight when feeding programmes like those outlined were compared with feeding a 9.7 per cent N and 8.3 per cent K_2O fertiliser solution at a standard concentration of 1:300 over the season.

These results may not apply to crops grown at other times of the year or under different conditions.

At Levin liquid feeds made up from ammonium nitrate and potassium nitrate, urea and potassium nitrate, and sulphate of ammonia and potassium nitrate gave equally good results.

5. Yields from different varieties

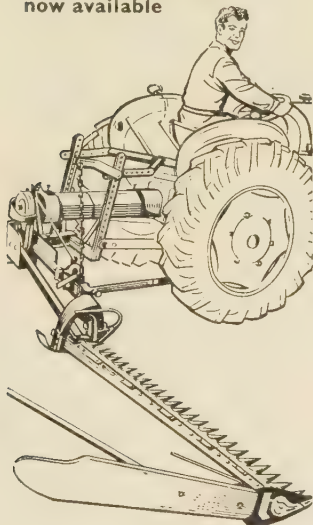
In the Levin trials plants have been kept virtually free of leaf mould disease. Under these conditions the variety **Ware Cross** has been consistently better in total yields than the other varieties used. Moneymaker has produced very good fruit, but lower total yields of marketable fruit. Potentate has been intermediate between these two. Some strain differences in Potentate were revealed. V-548 yield of marketable fruit has tended to be below that of Potentate.

6. Effect of trickle irrigation and liquid feeding on soil conditions

Soil acidity has increased very markedly in the Levin glasshouse plots. Plots receiving trickle irrigation and liquid fertilisers have become slightly more acid than the bucket-watered plots. Methods of overcoming this are being investigated.

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Surveys conducted in a number of glasshouses throughout New Zealand have confirmed work at the Glasshouse Crops Research Institute, Littlehampton, England, that where trickle irrigation is used, soil acidity tends to rise most under or close to the nozzles while soluble salts tend to be lowest in the wettest zone under the nozzles and highest in the drier zones between the nozzles.

When phosphate, potash, and lime are applied according to observations made on the previous season's crop, supplemented by soil analysis, it would appear from the Levin trials that the quantities of nitrogen and potash applied to the growing crop can vary considerably without effect on yield.

The method of applying them also appears to be unimportant provided the plants' requirements are met. The advantages of trickle irrigation and liquid feeding over conventional methods are thus in providing an easier method of applying water and nutrients and in making closer control of growing conditions possible if this should be required.

Once quantities of fertiliser, particularly nitrogen, have been applied in a dry form the grower can only withhold water if conditions demand that uptake of nitrogen should be restricted. Trickle irrigation and liquid feeding do give a little more scope for controlled growing.

. . . HOME GARDENING

year or the plants may be weakened and subsequent yield affected.

Crops such as lettuce, carrots, beet-root, radish, and kohlrabi require moist soil and good conditions to grow well. Late sowing of carrots has the advantage in some districts of avoiding attacks of aphids and carrot root fly.



Many weedkillers effective for certain crops have been developed in recent years and are used widely on commercial areas, but in home gardens weeds can usually be dealt with best by hoeing.

December Work in the Home Garden

By A. G. KENNELLY,

Horticultural Instructor, Department of Agriculture, Dunedin

WEED control, thinning seedlings, and spraying against insect pests and diseases are important and urgent jobs in many home gardens in December. Keeping garden work up to date is specially important to the many home gardeners who begin annual holidays of several weeks in late December, because neglect in December can lead to disastrous results if nothing is done in the garden until well on in January.

LIQUID manure can be applied to most crops lacking plant food, and, where necessary, watering should be attended to. Water is particularly important to beans, lettuce, and celery.

Kumara runners should be lifted periodically to prevent them from rooting. If they are lifted regularly, the vines will not mat together and it is much easier to turn them.

The pulling of main-crop rhubarb should stop early in the month, particularly where conditions are dry. Celery should be sprayed with captan or other suitable fungicide before leaf spot appears.

In the more humid districts potatoes should be sprayed with bordeaux mixture, copper oxychloride, or zineb for protection against late blight. The tubers should be kept well covered by moulding the soil to as sharp a ridge as possible.

Tall tomatoes need pruning, staking, tying, and, except in some southern districts, spraying with DDT against caterpillars and with bordeaux mixture or copper oxychloride or other suitable therapeutic to control fungous diseases.

Use Hoe Regularly

Weeds in established crops should be destroyed, as they deprive plants of food and moisture and often allow insect pests and diseases to carry over from season to season. Many new weedkillers effective for certain crops have been developed in recent years, but in the home garden hoeing is usually still the most effective means of control. Growth should be vigorous in the well cared for garden in December and a sharp hoe should be used regularly on weeds between the rows.

Weed control is specially important to weak-rooting crops, such as onions, as among onion crops which have not yet reached maturity weeds not only use up plant food, but when conditions are damp tend to hinder ripening of the bulbs. Some onion crops are ready for harvesting, but those that were planted late or are still growing well should be kept free of weeds and pests and diseases. DDT or lindane will control thrips and copper oxychloride will control mildew.

The harvesting season for asparagus should not be continued too long each

Melons and cucumbers are liable to suffer wind burn and sun scorch and like pumpkins and marrows need some shelter for best results in exposed situations or in the colder districts.

Except in the warmer districts, which have a long, comparatively mild period between late autumn and early winter, ground preparation for, or planting out of, early crops of winter greens should be high on the list of jobs for late December.

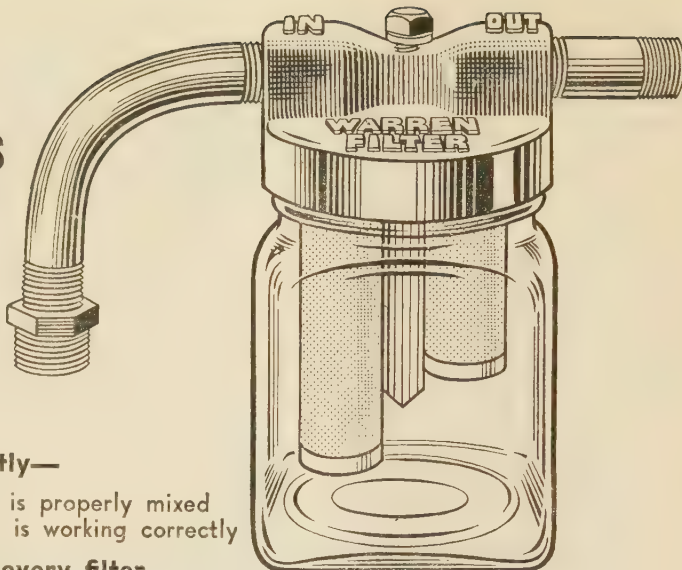
Lindane is a useful alternative to nicotine sulphate for the control of aphids, and it is also effective against caterpillars. Because of the danger of poisonous residues, it should not be used within seven days of harvesting.

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Preparing Hives for the Honey Flow

Seasonal Notes for the
Domestic Beekeeper

By R. H. HOBBS,
Apiary Instructor,
Department of Agriculture,
Greymouth

THE amount of honey gathered by a hive depends largely on the force of field bees when the honey flow begins. Build-up of colony strength depends on young, vigorous queens from good honey producing stock, an ample brood nest to allow the queen to lay to the maximum of her ability, and a good reserve supply of honey stores.

A POPULATION of between 60,000 and 80,000 worker bees is necessary when the main honey flow begins.

When conditions are favourable a young queen increases egg laying capacity rapidly until she reaches between 1,500 and 2,000 eggs a day. This maximum should occur about six weeks before the main honey flow, as the bees that are raised in the intervening weeks become the main worker force for gathering the crop.

Influence of Abundant Food Supply

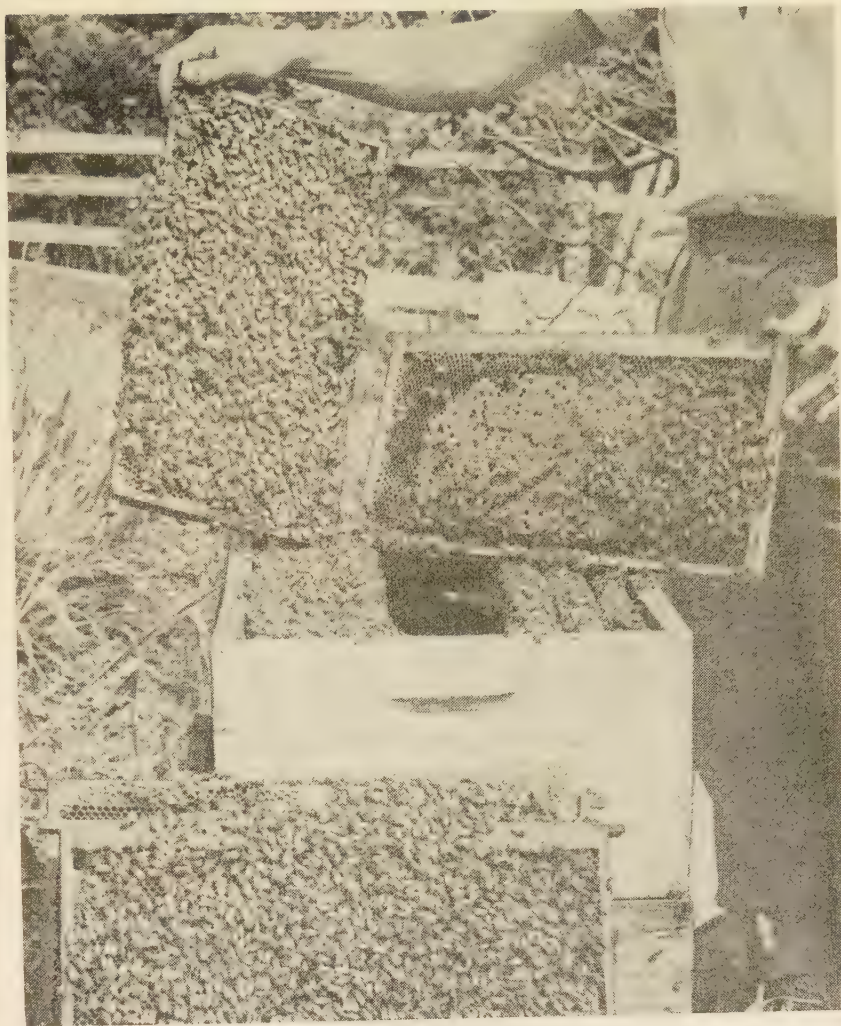
Hives must have an abundant reserve of honey and pollen if queens are to do their best. For the rapid increase of brood and bees during the latter stages of the spring build-up a large amount of food is required. If supplies are allowed to run low, the queen's egg laying is retarded and the colony will fail to develop full strength.

In many districts from late October until the main flow there is often a dearth of nectar and pollen which may continue until the clover flow begins.

In these areas the amount of stores in hives should be checked frequently and especially after cold, wet weather, as reserves are then rapidly depleted in maintaining brood rearing.

During this period hives may starve which could have been saved if they had been supplemented with feed combs of honey or sugar syrup.

Drones thrown out in front of the hive or dead or dying bees at the



A strong colony, showing comb of hatching brood suitable for building up a weaker colony.

entrance should be examined immediately, as this is usually a sign of starvation.

Colonies that are in an advanced stage of starvation should be given an emergency feed by sprinkling the bee cluster with a small amount of sugar syrup. Syrup should not be allowed to run down on to the bottom board and out the entrance, as this may cause robbing and loss of the weakened hive.

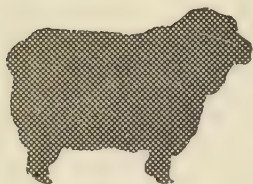
After this emergency feeding the colony should be given a supplementary feed of syrup in a division board feeder placed as near the cluster as possible. If combs of honey are available to supplement the stores, the capings should be broken in several places by raking the hive tool over

the combs before they are placed in the hive so that the bees have immediate access to it.

Building up Weak Colonies

Many beekeepers during the latter part of spring equalise the brood so that all hives are equally strong at the beginning of the honey flow. Combs of brood that are nearly ready to emerge and the adhering bees are taken from the strongest colonies and given to the weaker ones.

The combs can be given a light shake to remove the old bees and a check made to see that the queen is not on them. Combs of brood transferred to a weaker colony should be placed within the brood nest to pre-



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vent any of the brood from becoming chilled during cold weather.

Combs of brood removed from stronger colonies should not be wasted in an attempt to build up a weak hive with an old and failing queen unless the old queen is first replaced with a young laying queen. Usually with such hives it is better to kill the old queen and use her bees and brood to build up other hives that have young queens.

Before combs of brood are exchanged between hives all colonies in the apiary should be thoroughly examined for signs of American foul-brood (*Bacillus larvae*). Distribution of brood from an infected hive will spread this disease rapidly through an apiary.

Prevent Swarming

Most swarming occurs during the build-up in late spring when hives are very populous. In some years swarming can be particularly troublesome, especially when there are prolonged spells of broken weather. The colonies then start swarm cells, which, if left to develop, will result in the bees swarming on the first fine day.

Destroying queen cells when they are first started and expanding the brood nest will often control swarming.

The brood nest should be checked over thoroughly every seven to 10 days and all queen cells destroyed. Removing one or two combs of brood from the brood chamber and placing them in the upper super, then replacing them with good empty combs or frames of foundation, will give the queen more room to lay if the brood nest becomes crowded.

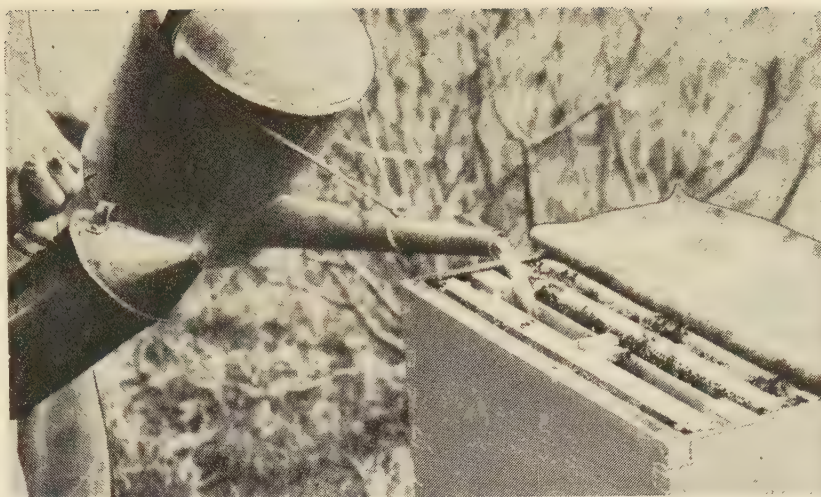
Spreading the brood by placing two or three empty combs alternately with combs of brood in the brood chamber is another method of enlarging the brood nest and encouraging the queen to lay more eggs when they are most required. This method should not be overdone, as the bees may not be able to cover all the brood during cold weather.

If the brood becomes chilled and dies, the hive will be given a serious check from which it may not recover in time for the honey flow. It is best to put the older brood combs in the brood nest, as the queen will lay in these more readily than in combs from newly drawn foundation.

Early Supering

When colonies become well filled with bees and brood an extra super of combs may be added. Supering a little in advance often proves a good swarm control measure, as the bees can then expand into the extra super during the warmer part of the day and avoid overcrowding.

However, extra supers should not be added too early, as the bees may not be able to maintain the proper hive temperature during cool weather.



A division board feeder placed close to the brood nest and being filled with sugar syrup.

When extra honey supers are put on early in the season and queens have access to them they sometimes lay their eggs in the centre combs. Entry of the queens to these supers can be avoided by placing between the brood chamber and the honey supers a mat folded back about 5 in. from the front of the hive to allow the worker bees access to the upper super. When the honey flow begins the mat is removed to allow the bees full access to the top supers.

Hives that have been wintered as single-storey units will by now require an additional super of combs. In colder weather it is often advisable

to place the added super on the bottom board and the super containing the bees and brood on top, as the bees are then better able to maintain a correct hive temperature. Later, as more room is required, the bees will expand into the empty lower super, and the queen will follow and extend her brood nest into the middle combs. Once the queen has extended her egg laying into the bottom super the positions of the supers should be reversed.

This manipulation will extend the queen to the limit of her egg laying capacity when a maximum amount of brood is essential.

Meteorological Records for September

Station	Height of station above M.S.L. (ft)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours	
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall			
				Maximum	Minimum				Amount	Date		
Kerikeri	240	55.8	+ 2.0	69.1	37.0	11.01	19	+	5.87	1.83	29	104
Auckland	160	55.8	+ 1.3	65.0	44.0	9.03	19	+	5.24	1.31	29	97
Tauranga	12	54.1	+ 1.5	65.1	37.4	7.22	16	+	3.00	1.66	14	135
Ruakura	131	53.5	+ 2.6	68.5	32.4	9.46	18	+	5.78	2.61	14	122
Whakarewarewa	1,006	51.2	+ 2.2	64.2	32.3	7.69	18	+	2.95	1.51	14	93
Gisborne	14	54.1	+ 2.0	67.4	37.7	2.76	16	+	0.14	1.21	14	116
New Plymouth	160	53.8	+ 2.1	63.0	38.6	9.79	18	+	4.89	3.64	5	112
Karori	2,125	46.9	+ 1.9	61.1	27.8	3.45	17	—	0.82	0.67	6, 10	
Napier	5	54.2	+ 2.2	69.9	37.5	2.32	18	+	0.35	0.55	14	114
Wanganui	72	53.0	+ 0.9	70.0	38.6	3.60	15	+	1.06	0.91	9	132
Palmerston North	110	52.6	+ 2.1	66.8	35.8	3.96	18	+	0.95	1.04	9	121
Waingawa	340	50.2	+ 0.9	65.0	31.0	3.66	19	+	0.39	0.94	9	114
Wellington	415	50.6	+ 0.7	64.9	39.2	6.16	18	+	2.32	1.46	10	135
Nelson airfield	5	50.6	+ 2.4	66.7	31.1	4.07	14	+	0.91	0.84	5	136
Blenheim	14	51.3	+ 1.1	68.9	33.1	3.31	11	+	1.03	0.61	5	165
Hokitika South	15	50.0	+ 2.2	62.8	33.1	10.87	18	+	2.25	1.88	4	119
Hanmer Forest	1,270	46.5	+ 0.4	65.8	25.0	2.89	11	—	1.54	0.74	9	132
Christchurch	22	49.5	+ 0.8	73.5	31.7	1.15	8	—	0.91	0.34	15	134
Ashburton	323	48.0	+ 0.1	70.8	28.2	1.88	10	—	0.74	0.86	9	119
Timaru	56	48.0	+ 0.1	70.2	30.8	1.79	11	—	0.16	0.60	9	130
Alexandra	520	47.5	+ 0.4	67.0	29.4	1.09	7	+	0.27	0.42	9	156
Taieri	80	45.9	+ 1.8	66.0	25.0	1.26	12	—	0.67	0.50	9	127
Invercargill airfield	0	45.8	+ 0.1	65.8	27.9	2.16	13	—	1.06	0.65	7	161
Chatham Island	150	48.0	— 0.1	57.0	35.2	1.17	12	—	1.28	0.26	6	

Aerial Topdressing and Molybdenised Superphosphate on a Coromandel Hill Country

Store Sheep and Cattle Farm



← The homestead, which overlooks Coromandel Harbour, and store sheds in the foreground.

By G. L. BANFIELD,
Farm Advisory Officer, Department of Agriculture, Thames*

THE story of Coromandel County has been typical of that of much hill country in New Zealand. There was a brief period of prosperity based on the fertility released by the original bush burns, the rapid utilisation of which led to manuka reversion. Aerial topdressing and molybdenised superphosphate, assisted by higher wool prices, have arrested this trend and already sheep numbers for the county have surpassed any previous record. This trend is well exemplified in the following article, in which Mr D. James's property at Coromandel is taken as an example.

THE farm of 1,120 acres, delightfully situated on a small peninsula which encloses the southern side of the Coromandel Harbour, has been in the James family since 1895. No more attractive setting could be found for the homestead, which nestles in a sunny bay overlooking the harbour. Tropical fruits including banana palms, from which are harvested about a

hundredweight of bananas each year, flourish round the homestead and indicate the mild climate.

A 60 in. annual rainfall is fairly well distributed throughout the year, but still leaves much to be desired during summer. One year in five could be

* Since appointed Assistant Fields Superintendent, Dunedin.

described as a drought year, but droughts are not severe enough to cause stock losses. The farm is situated on Awapuku clay loam, an andesitic soil characteristic of much of the farmable hill soils of Coromandel Peninsula. In the main the land is steep, but there are gentler slopes and flatter tops which can be cultivated, though such areas make up a small proportion of the soil type. Natural creeks ensure a plentiful water supply.

Mr D. James leased the property in 1952 after managing it on behalf of the family for the previous 10 years, and in 1957 he bought the farm.

Property before Improvement

Until comparatively recently the method of farming the property was to cut as much of the regrowth manuka scrub each year as was possible and sow the burn with danthonia and browntop. Each autumn the

danthonia was burnt to remove the roughage and induce some palatable growth sufficiently high in nutritive value to sustain the stock. Where burning was not carried out stock, especially hoggets and younger sheep, failed to thrive. A good burn was usually followed by an additional 1,000 lb of wool for that year.

In spite of a 60 in. annual rainfall the property dried out very badly in summer, so that the rearing of cattle was extremely difficult; nor was there anything to be made out of mature cattle. Apart from this aspect the removal of the roughage by the cattle resulted in an unsatisfactory burn with consequent poor control of the re-growth manuka.

Corriedale sheep were introduced in an endeavour to obtain a breed which would thrive on the type of pasture available and they did prove hardier than Romneys. There was a return to the Romney, however, as soon as development was started.

Revenue came from the sale of wool, store wethers, and cast-for-age ewes. Mortality in the young stock was very high.

A disconcerting feature of these soils was the almost complete lack of response to superphosphate or serpentine superphosphate, even with adequate liming; and in addition to all these problems there appeared to be trace element deficiencies affecting the health of the stock.

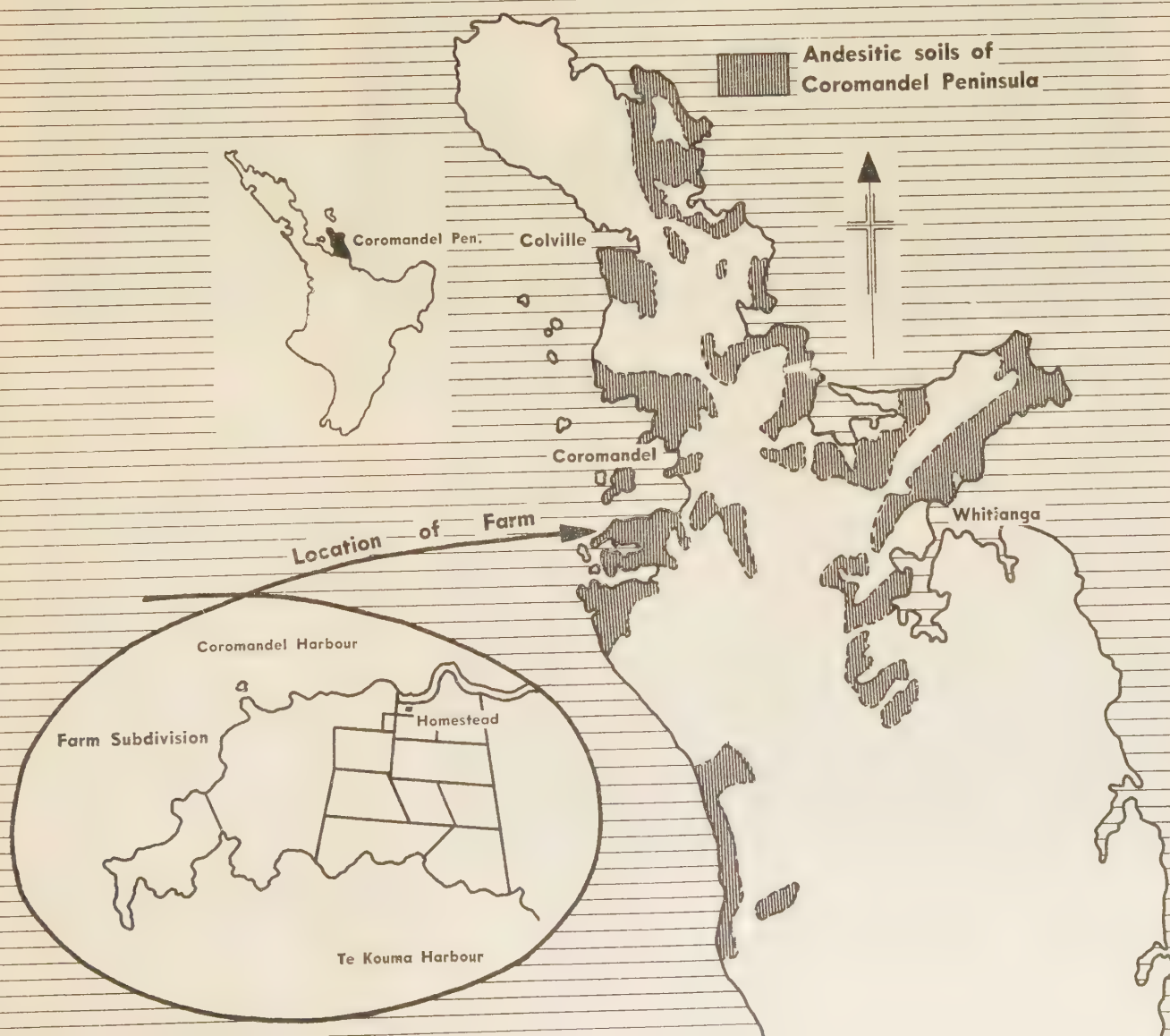
High Transport Cost

Transport costs, too, were very high; up to £3 per ton for fertiliser, 3s. 3d. per lamb to the works, and 14s. per bale of wool to Auckland by boat from Coromandel. Lending institutions understandably had little confidence in this country, the final failure of which was considered by them to be inevitable.

These were the problems faced by Mr James and other hill country farmers on Coromandel Peninsula.

"Studies in Farm Management" was the title of a series of articles in the "Journal" in the 1940s in which farms setting a good standard in a particular type of production or under particular conditions were discussed.

In selecting farms for study in this further series the criterion has been that their management has illustrated successful application of some of the new farming techniques that have made possible appreciable increases in production or the successful farming of hitherto problem country.





We want 1232 lbs of Spanish onions, Tony!... (AND THREE JARS OF ROLLMOPS)

If your mother put *that* on her shopping list, there would indeed be questions asked! (*This is Alf, taking up the story of 'Fremantle Star'.*) We put it on ours, but then—we're shopping on the grand scale. We're down in London Docks, making 'Fremantle Star' ready for her maiden voyage which means we've got to put on board enough food and drink and linen and cutlery to keep about 90 people happy for about four months.

So we're buying sugar and potatoes by the *ton*; we're buying oranges and lemons and grapefruit by *hundreds*. We've given the butcher an order for 3,000 lbs. of beef, with mutton and lamb and veal in proportion, sufficient to take her to New Zealand, where she will be stocked to capacity with your produce. And we haven't forgotten the smaller things: a pound of caraway seeds and another of crystallised violets (they're for the bakery); half-a-pound of cinnamon and three jars of pickled walnuts... I don't think that even the most

exacting housekeeper could find fault with our shopping list.

On top of all this, there's the sheets and blankets and pillow-cases; the table-cloths and napkins; the knives and forks and spoons; the cups and plates and pots and pans. We've even ordered a milk churn and an ice pick!

By the time it's all aboard and stowed, the grocery store will look like a very well-stocked shop and you won't be able to get *inside* the vegetable and meat rooms.

It won't be long now before 'Fremantle Star' slips her moorings and eases out of London's docks into the waters of the Thames, en route for New Zealand. She won't be coming empty-handed; her holds will contain merchandise and materials consigned to New Zealand ports. 'Fremantle Star', latest and most modern addition to the ships of the Lines is, from now on, actively at your service.

You'll be seeing her, Tony!

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Development Programme

As topdressing alone had failed to give any worthwhile improvement, a cropping and regrassing programme was begun in 1950. As might be expected turnip and swede crops proved to be very poor. Even so, they provided some useful feed at a time when it was most needed.

The following seed mixture was sown down with $\frac{1}{2}$ ton of lime and 3 cwt of "super. compound",* an amount of phosphate now known to be inadequate:

	lb per acre
Perennial ryegrass	15
Short-rotation ryegrass ..	5
Cocksfoot	5
Paspalum	4
Crested dogstail	2
White clover	2
Subterranean clover (Mt Barker)	1 $\frac{1}{2}$
Subterranean clover (Talla- rook)	1 $\frac{1}{2}$
	—
	36
	—

In 1952 the lime was increased to 1 ton per acre and the phosphate to a total of 9 cwt in the first year after grassing down.

These sown pastures, totalling 200 acres, though reasonably good at first, deteriorated fairly rapidly and fertiliser trials failed to show why. It was concluded that the summers were too dry for white clover, and its disappearance did seem to coincide with the drier summers.

Stock on this country were poorly grown and had a somewhat brittle bone structure. Drenching trials were carried out to determine whether a cobalt or copper deficiency had any bearing on this problem, but results were inconclusive, though the copper treatment did seem to produce a slight improvement in the wool.

After the success of molybdenum trials in Coromandel County, supported by further trials on Mr James's farm, 65 tons of molybdenised superphosphate was applied in 1956. This, with a further 40 tons in 1957, increased annual wool production from 10,000 to 15,000 lb.

The trials indicated that though molybdenised superphosphate gave spectacular results, the response could be doubled by use in addition of $\frac{1}{2}$ ton of lime per acre; even with 5 cwt of lime in addition results were markedly superior to those from molybdenised superphosphate alone. Basic slag proved as effective as molybdenised superphosphate alone, but inferior to molybdenised superphosphate where lime had been applied initially.

* A superphosphate mixture used at this time because of reduced superphosphate production arising from a world sulphur shortage.

IMPROVING COROMANDEL HILL COUNTRY



Woolshed and yards at western end of homestead beach.



Cultivated country which carries up to five ewes per acre.

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the difficulties, seasonal or otherwise, which he would have to meet. The National Bank really does try to help. Drop into your local branch and see for yourself. Or write for our free booklet 'The National Bank'

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IMPROVING COROMANDEL HILL COUNTRY

The 200 acres of sown pastures on Mr James's property were saved from further deterioration and have now improved to the point where they are carrying up to five ewes per acre. A further 150 acres, by substantial topdressing and oversowing with white clover, is now carrying a fair pasture in which the proportion of ryegrass is increasing rapidly. The rest of the property, consisting of unimproved danthonia and browntop pastures, has received a total of only $1\frac{1}{2}$ cwt of molybdenised superphosphate per acre, but even so considerable support is now obtained from annual *Lotus* species during winter and spring.

In sharp contrast to the past, stock raised on the property are well developed and of superior quality. The apparent trace element deficiencies have disappeared completely and it can be assumed that stock had been suffering from nothing more than malnutrition.

Subdivision has been pushed ahead steadily, there now being 10 paddocks. However, the back portion of the property, making up half of the farm, is still one big paddock. Mr James believes that subdivision alone is of little value; it must be preceded or accompanied by at least some topdressing. Concentrating stock on to completely untopdressed country has resulted in loss of stock rather than control of second growth and roughage, and certainly has not resulted in increased carrying capacity. On the other hand, if some topdressing has preceded or has at least accompanied a subdivision programme, the fencing has been well worth while.



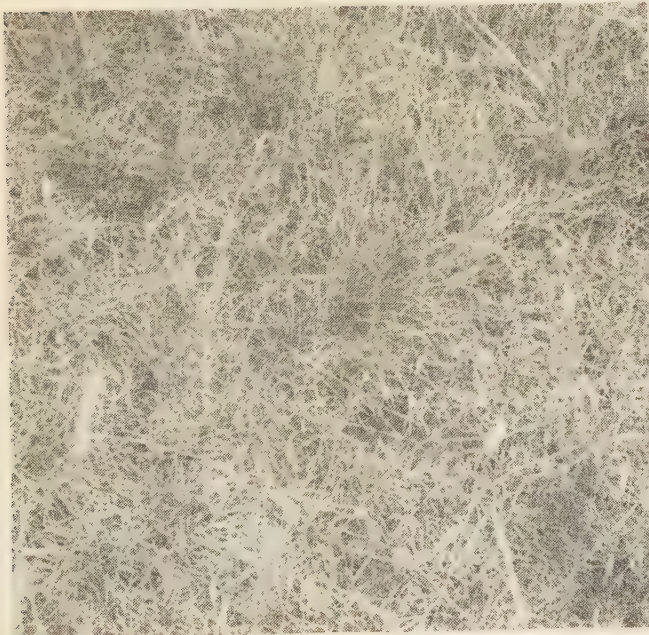
Unimproved danthonia-browntop pastures on the end of the peninsula carry less than one sheep per acre.

Where discing is possible it has proved to be the best method of removing second growth. Where the tractor cannot be taken a rapid build-up of fertility has been aimed at. Even so, some scrub cutting has been necessary during the initial period of fertility build-up.

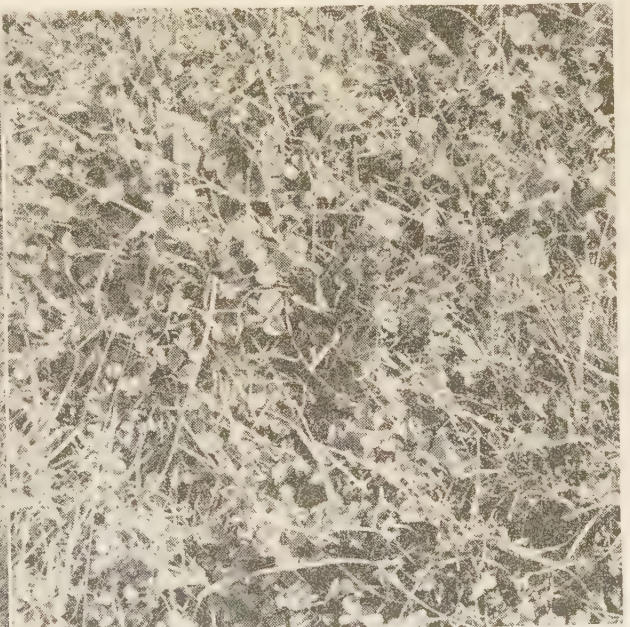
Stock Management

The property is farmed in two blocks: The 200 acres of cultivated land and a further 150 acres which has been improved by topdressing and oversowing are used as breeding country; steers and dry sheep are run on the unimproved danthonia-brown-

UNIMPROVED PASTURE



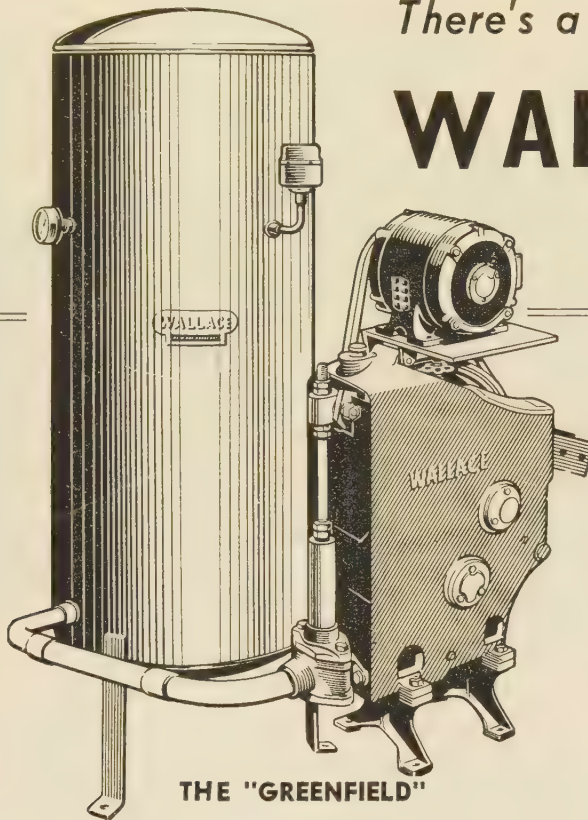
SOWN PASTURE



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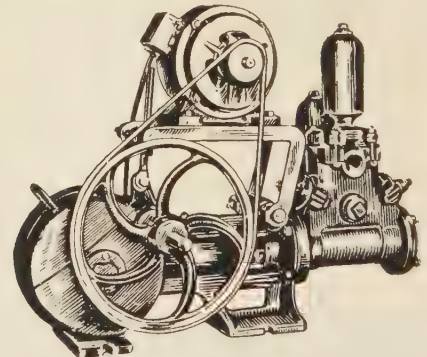
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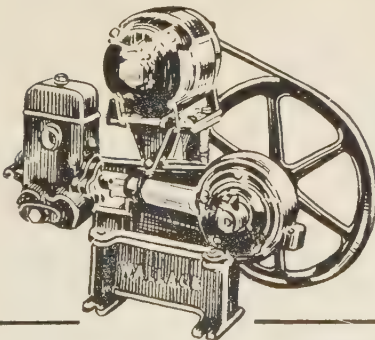
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IMPROVING COROMANDEL HILL COUNTRY

top pastures, their numbers being made up from the breeding country. However, the ewes are mobbed on to the harder country for a period after weaning to take off their condition and to help with the control of roughage and are again used on this country immediately after tupping.

The rams, selected on wool and clean, open faces, are all put out on 1 March, no attempt being made to flush the ewes beforehand. Some flushing does occur, however, since the ewes are concentrated on some of the best paddocks for tupping. The owner prefers one good lamb from each ewe rather than twins, which do not do so well at the present stage of development of the property.

The 2-tooths are run separately and are tupped by 2-tooth rams to eliminate any chance of inbreeding. In spite of the inexperience of such rams the exceptionally high lambing percentage of 90 is achieved with the 2-tooths. After a month the 2-tooths are returned to the main flock for convenience in stock management.

About a quarter of the breeding country is closed about the beginning of May to provide lambing feed, the ewes being tightened up to make provision for this. The saved pasture normally provides for about four to five weeks' grazing, by which time spring growth is starting to come away.

An endeavour is made to divide the flock into early and late lambers so that more time can be spent with ewes close to lambing. Shepherding at lambing is carried out with meticulous



Manuka regrowth on uncultivated land.



Subdivision is proceeding steadily on lines cleared with the bulldozer blade.

care and it is here that Mr and Mrs James bring all their skill to bear, making full use of antibiotics and antiseptics, with the result that ewe losses are down to 1 per cent. The unusual practice is adopted of moving the newly lambed ewes with their lambs on to the saved pasture, a procedure adopted not through desire but necessitated by the arrangement of paddocks, which does not facilitate shedding.

Twin lambs are given identical marks at birth to facilitate mothering up when a lamb is neglected.

The ewes are set stocked from lambing until they are weaned, but are mob stocked at all other times. Shearing begins at the beginning of November, when both ewes and ewe lambs are shorn. Wether lambs are normally sold fat as woolly lambs. Fleece weights in recent years have been averaging 9 lb per ewe.

The lambs are weaned about the end of November and are given the best of the remaining feed, the ewes being put out on to the harder country.

In the 1958-59 season all the wether lambs were sold fat. During last season, however, with fat lamb prices

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'25' '50' '100'

with the thin, smooth nozzle.

Available in either round or flat tins.

Scientifically manufactured under Laboratory control with special machinery to provide a consistently fine, even texture ensuing every injection without blockage.



THREE STRENGTHS

'100' '500' '1500'

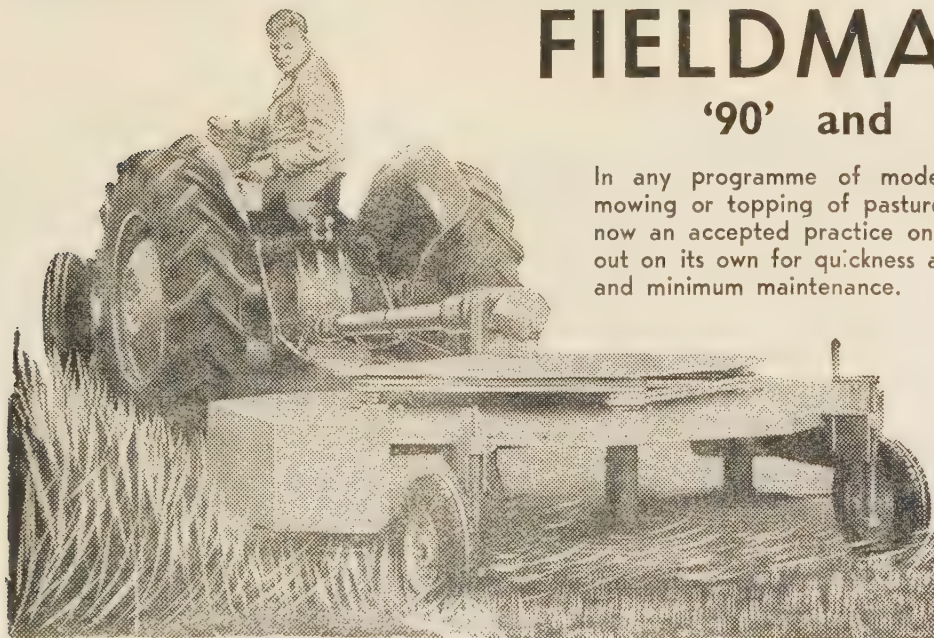
FOR SHEEP after assisted lambing, and all farm animals. Bloodpoisoning and Blackleg in Sheep, Footrot in Cows and Pigs, Arthritis in Lambs and Pigs.

In flat tins with hypodermic needles.

FIELDMASTER

'90' and '60'

In any programme of modern pasture improvement (and mowing or topping of pastures to control summer growth is now an accepted practice on most farms) the Fieldmaster is out on its own for quickness and efficiency, low running costs and minimum maintenance.



FEATURES INCLUDE:

Rugged main frame designed to withstand stresses from all angles. Special drawbar and skid—to prevent cutters digging in on uneven ground.

Fully shielded, heavy duty, telescopic P.T.O. shaft for operator safety.

Fieldmaster cannot be matched for rough and heavy cutting.



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down, they were sold on the somewhat buoyant store market. All of the ewe lambs are retained and are normally reared without much difficulty. They are spread over the greatest area possible on feed prepared for them by cattle.

Mr James considers that at least one cattle beast is required to every 10 sheep to control the roughage on his property adequately, and he is accordingly building up breeding cow numbers steadily. Seventy breeding cows are carried at present and the normal calving percentage is between 80 and 90. Surplus progeny are sold, mainly as store two-year-olds. During winter any cows in poor condition are taken from the main mob and are given preferential treatment, which usually includes some hay feeding. For this purpose about 200 bales of hay, the limit of present storage space, are bought in each year.

Pasture Management

Since the country dries out rather badly in summer, Mr James is at some pains to avoid overgrazing. At the same time he has found it just as important to control the growth at all stages to avoid army caterpillar attack and production of fibrous, low-quality feed.

Some farmers on the peninsula have failed to appreciate just how poor roughage can be when carried from summer right through to winter, especially where the pasture consists of an untodressed danthonia-brown-top sward completely devoid of clovers. Where they have failed to appreciate this point severe losses have occurred even among mature sheep.

Mr James believes that if the pasture is correctly controlled at all times the stock look after themselves.

Buildings and Facilities

Space for erection of buildings is confined to a narrow strip above the beach on either side of the homestead. Though the shearing shed and yards are perhaps a little cramped at the western end of the beach, they pro-

vide ready access for road transport of wool and stock. A large implement shed at the eastern entrance to the beach houses the usual range of implements, including a light crawler tractor fitted with a bulldozer blade, an implement which is of inestimable value on this class of country for servicing tracks and clearing lines for fencing.

Some of the property is strewn with large boulders. To collect these into

large heaps to facilitate cultivation the bulldozer can be modified by the removal of the actual blade and by the substitution of a bar to which rooting prongs have been attached. With this device the boulders can be lifted and rolled along the ground with an ease which has to be seen to be fully appreciated.

Weed Problems

Though fern is a problem on properties further inland, where the rainfall is heavier, it is of very little concern on Mr James's farm. Manuka, tauhinu, and Spanish heath still constitute a major problem on much of the uncultivated country. In the past the growth was controlled by burning alone, but such burns are now followed by oversowing and heavy topdressing, the aim being to establish a reasonably high-fertility pasture capable of competing successfully with these low-fertility weeds.

Ratstail is proving a problem, particularly on areas improved by top-

IMPROVING COROMANDEL HILL COUNTRY



Area at right of pegs was cleared of ratstail with $2\frac{1}{2}$ lb of dalapon per acre.

WOOL WEIGHTS, TOPDRESSING, AND CARRYING CAPACITY

		Season ended 31 March							
		1953	1954	1955	1956	1957	1958	1959	
Wool (lb)		6,052	8,167	9,240	10,706	10,750	15,150	14,620	
Fertiliser (tons)		20	26	36	*65	*40	*60	*45	
Ewes		650	650	600	650	800	800	850	
Hoggets		350	500	500	500	500	550	550	
Wethers		100	200	200	150	60	150	110	
Mature cattle		50	75	85	70	86	77	85	
Calves		8	25	30	73	35	42	44	

* Molybdenised superphosphate

dressing but without cultivation. Trials on the property have indicated, however, that this weed can be eliminated with dalapon when applied at rates as low as 2½ lb per acre. This treatment may solve the problem.

Conclusion

The application of 9 cwt of molybdenised superphosphate per acre over three or four years, with the introduction of some clover seed, has resulted in a spectacular improvement in the pastures of these Coromandel hill soils. Already fertility has been lifted on a number of properties to the point where ryegrass is creeping steadily into pastures which formerly were

IMPROVING COROMANDEL HILL COUNTRY



Heaping up stones with the "boulderdozer" blade to facilitate cultivation work.

poor swards of danthonia and browntop.

So far the application of molybdenised superphosphate has not upset the copper-molybdenum balance of the soil on any farm in the district, but it is considered that once a total of 9 cwt of molybdenised superphosphate per acre has been applied it is time to alternate such dressings with forms of phosphate other than molybdenised superphosphate.

Though Mr James still has a long way to go to develop his property fully, he and the other hill country farmers in the Coromandel area now have a future which could not be envisaged a few years ago.

Agricultural and Pastoral Show Dates

THE following are dates and venues of A. and P. shows up to the end of April 1961.

NORTH ISLAND

November

- 18 and 19 November—Egmont A. and P. at Hawera.
- *19 November—Waihi A. and P. at Waihi.
- 19 November—Rotorua A. and P. at Rotorua.
- 19 November—Bay of Islands P. and I. at Waimate North.
- *25 and 26 November—Auckland A. and P. at Epsom, Auckland.
- 25 and 26 November—Stratford A. and P. at Stratford.
- 30 November—The Plains A. and P. at Ngatea.

December

- *3 December—Kaikohe A., P., and H. at Kaikohe.
- 3 December—Hauraki A. and P. at Paeroa.
- 3 December—Helensville A. and P. at Helensville.
- *10 December—Whangaroa A. and P. at Kaero.

January 1961

- 2 January—Nuhaka A. and P. at Nuhaka.
- 14 January—Central Hawke's Bay A. and P. at Waipukurau.
- 20 and 21 January—Feilding I. A., and P. at Feilding.
- 20 and 21 January—Wairoa County A. and P. at Wairoa.
- *27 and 28 January—Horowhenua A. and P. at Levin.
- 28 January—Galatea A. and P. at Galatea.
- 28 January—North Kaipara A. and P. at Paparoa.

February

- *1 February—Marton District A. and P. at Marton.
- 3 and 4 February—Rodney A. and P. at Warkworth.
- *4 February—Rangitikei A. and P. (Golden Jubilee) at Taihape.
- 4 February—Woodville A. and P. at Woodville.
- 4 February—Katikati A. and P. at Katikati.
- *7 and 8 February—Dannevirke District A. and P. at Dannevirke.

- 8 February—Te Awamutu A., P., and H. at Te Awamutu.

- 10 and 11 February—Taranaki A. and P. at New Plymouth.

- 10 and 11 February—Taumarunui District A. and P. at Taumarunui.

- 11 February—Hukerenui A. and P. at Hukerenui.

- 11 February—Tauranga A. and P. at Tauranga.

- 11 February—Pahiatua A. and P. at Pahiatua.

- 16 February—Matamata A. and P. at Matamata.

- 17 and 18 February—Franklin A. and P. at Pukekohe.

- 17 and 18 February—Ohura A., P., H., and I. at Nihoniho.

- 17 and 18 February—Masterton A. and P. at Masterton.

- *18 February—Waiapu A. and P. at Ruatoria.

- 18 February—Te Puke A. and P. at Te Puke.

- 18 February—Northern Wairoa A. and P. at Mititai.

- 24 and 25 February—Wellington and Hutt Valley A. and P. at Trentham.

- 24 and 25 February—Te Kuiti and District A. and P. at Te Kuiti.

- 25 February—Mangonui County A. and P. at Kaitiaki.

- *25 February—Whakatane A. and P. at Whakatane.

- 25 February—Waimarino A. and P. (Golden Jubilee) at Raetihi.

- 25 February—Putaruru District A. and P. at Putaruru.

March

- *1 March—Morrinsville A. and P. at Morrinsville.

- 4 March—Omotiki A. and P. at Omotiki.

- 11 March—Kumeu District A. and H. at Kumeu.

- 18 March—Wellsford A. and P. at Wellsford.

SOUTH ISLAND

November

- 18 and 19 November—Nelson A. and P. at Richmond.

- 19 November—West Otago A. and P. at Kelso.

- 19 November—Courtenay A. and P. at Kirwee.

- *19 November—Waimate A. and P. at Waimate.

- 19 November—Taieri A. and P. at Outram (Centennial Show).

- *22 and 23 November—Timaru A. and P. at Timaru.

- 26 November—South Otago A. and P. at Balclutha.

December

- 3 December—Otago Peninsula A. and P. at Portobello.

- 3 December—Winton A. and P. at Winton.

- *6 and 7 December—Gore A. and P. at Gore.

- 10 December—Wyndham A. and P. at Wyndham.

- *16 and 17 December—Southland A. and P. at Invercargill.

January 1961

- 14 January—Wallace A. and P. at Otautau.

- 14 January—Blueskin A. and P. at Waitati.

- *21 January—Waiau A. and P. at Tuatapere.

- 21 January—Golden Bay A. and P. at Takaka.

- 21 January—Peninsula Horse and A. and P. at Duvauchoelle.

- 24 and 25 January—Otago A. and P. at Dunedin.

- 28 January—Banks Peninsula A. and P. at Little River.

- 28 January—Palmerston and Waihemo A. and P. at Palmerston.

February

- *11 February—Inangahua A. and P. at Reefton.

- 18 February—Murchison A. and P. at Murchison.

- 25 February—Kaikoura A. and P. at Kaikoura.

- 25 February—Buller A. and P. at Westport.

March

- 4 March—Temuka and Geraldine A. and P. at Winchester.

- *4 March—Rai Valley A. and P. at Rai Valley.

- 4 March—Amuri A. and P. at Rotherham.

- 11 March—Mayfield A. and P. at Mayfield.

- *11 March—Mt. Benger A. and P. at Roxburgh.

- 18 March—Hawarden A. and P. at Hawarden.

- *18 March—Upper Clutha A. and P. at Wanaka.

- *25 March—Methven A. and P. at Methven.

April

- 3 April—Strath-Taieri A. and P. at Middlemarch.

- 3 April—Mackenzie Highland Show at Fairlie.

- *15 April—Malvern A. and P. at Sheffield.

* The Department of Agriculture exhibit will be staged at this show.

Earmarking Systems for Identifying Pigs

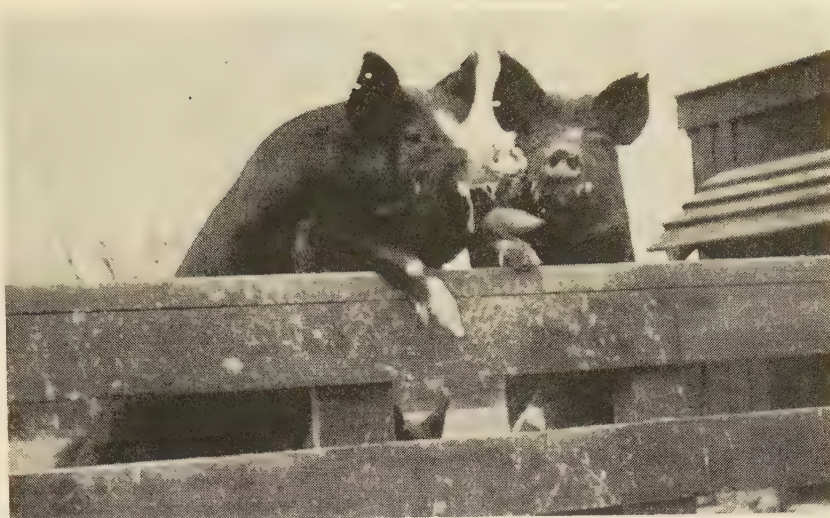
TWO systems of earmarking for identifying pigs are described in this article by I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington. One has been used for many years by the Department for identifying all recorded pigs; the other is more suitable where large numbers of pigs have to be individually identified.

IDENTIFICATION of pigs is essential to their successful management, especially for the stud breeder. Three methods are in common use—tattooing, ear-tagging, and ear notching—and of these the last is undoubtedly the best, being as nearly permanent as possible.

Notching, or earmarking, has an advantage over tattooing in that it can be used for all breeds of pigs and, if neatly done, remains legible regardless of the age of the pig. The pig's number can be read in the paddock without the necessity of yarding the animal and perhaps washing its ear. Metal tags are also unsatisfactory, as they are frequently lost through fighting, rubbing against fences, and other accidents. The pig also has to be caught and the tag cleaned before it can be read.

Both the systems described depend on giving a number to every mark that is cut in different positions on the ear. The best type of marker is one with a straight blade not more than 3/16 in. wide. As the mark grows with the pig, its depth should vary according to the size of the pig. Marking of pigs that have not been weaned should not be more than 1/4 in. deep; the mark will be more than 1 in. deep when the pig is fully grown.

No mark should be placed on the upper edge of the ear between the base of the ear where it joins the head and a point two-thirds of the distance between the head and the tip of the ear, as there is a thick piece of cartilage there that holds the ear erect, and if it is severed, the ear will droop, making the marks difficult to



read and spoiling the appearance of the pig.

System A

The first system (System A) has been used by the Department for many years for marking all pedigree recorded pigs. It was originally used at Lincoln College and has the advantage that only one implement is required, as no punch holes are used.

The numbering begins at the base of the right ear on the lower edge, the mark close to the head representing 0, and continues round the tip to the upper edge of the right ear, over to the upper edge of the left ear and round it to the base, the numbers going up to 9, 0 to 4 on the right ear and 5 to 9 on the left as shown in the diagram below.

In reading the pig's number a start is always made at the base of the right ear on the lower edge and the number is read from the mark nearest that point round in the direction of the number 9 mark.

It therefore follows that every number will always have the lower digit first; thus a pig with marks 1-2-3 will never be 132, 231, 213, 321, or 312. Many numbers are therefore omitted.



System A.

The following numbers only can be used:

One mark numbers—0, 1, 2, 3, 4, 5, 6, 7, 8, 9 = 10 numbers.

Two marks numbers—01, 02, 03, 04, 05, 06, 07, 08, 09, 12, 13, 14, 15, 16, 17, 18, 19, 23, 24, 25, 26, 27, 28, 29, 34, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59, 67, 68, 69, 78, 79, 89 = 45 numbers.

Three marks numbers—012, 013, 014, 015, 016, 017, 018, 019, 023, 024, 025, 026, 027, 028, 029, 034, 035, 036, 037, 038, 039, continuing until 789 is reached.

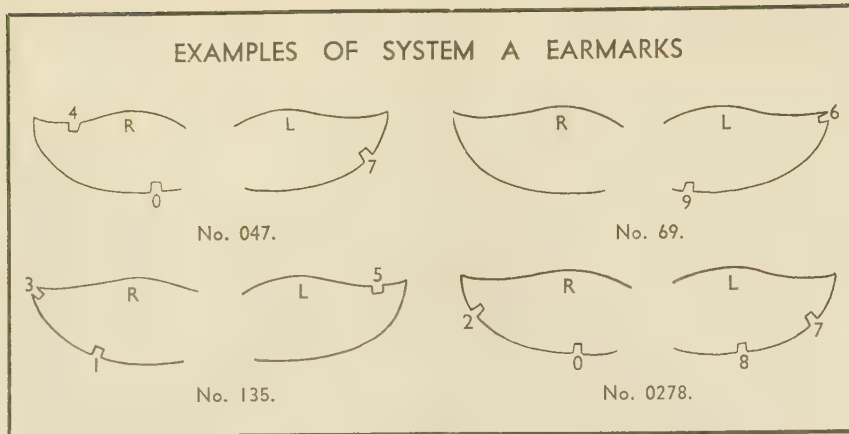
Note: The number following 089, is 123, since this is the first number greater than 029 that retains the sequence of the smallest number first = 120 numbers.

Four marks numbers—0123, etc. = 210 numbers.

This system gives a grand total of 385 individual numbers using not more than four marks on each pig.

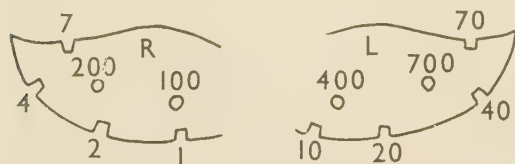
As sex and breed also differentiate the pigs, boars and sows can be marked with the same earmark in any system, and a breeder running more than one breed can mark animals of different breeds with the same mark. If these marks are carefully put in, there is little chance of confusion. Nought and 9 should always be placed as close to the head as possible and 2 and 7 within 1 in. of the tip of the ear. One and 8 should be placed exactly halfway between the head and the tip of the ear.

This system has the advantage of being easy to memorise and read, but it is more applicable to the smaller herd of breeding sows.



System B

The second system (System B) uses both ear notches and punch holes and gives a consecutive series of individual earmarks from 1 to 1499. It is therefore useful in really large herds, but is rather more difficult to memorise and read than the first system.



System B.

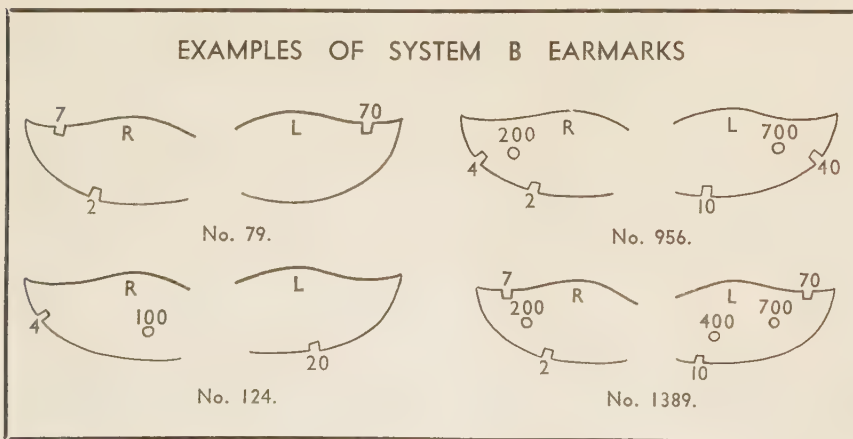
In this system, as shown in the diagram below, four notches and two punch holes are used in each ear. The four notches in the right ear represent the four digits 1, 2, 4, and 7. By use of one of these or two added together any digit from 1 to 9 can be obtained. Similarly the notches in the left ear represent the tens (10, 20, 40, and 70) and again by use of one notch or two added together any ten from 10 to 90 can be obtained.

The two punch holes in the right ear represent 100 and 200 and the two

in the left ear 400 and 700. By use of one, two, three, or all four punch holes any hundred from 100 to 1400 can be obtained.

As this system depends on adding the values allotted to the various notches and punch holes, they need to be accurately positioned in the ear. Care should be taken to avoid cutting any of the veins in the ear. These, however, are fairly easy to see, even in black pigs. Two instruments are required, an earmarker and an ear punch, and as most pigs are quite young when marked, neither of these implements should be too big.

A satisfactory system of identifying pigs is absolutely essential for all who breed pigs, both pedigree breeders and commercial breeders. Without such a system the keeping of accurate records is impossible and on these records the success of the pig enterprise depends. Both the systems described are simple and efficient and, provided reasonable care is taken to apply the marks accurately, are as near permanent and foolproof as possible.



Sporing of Facial Eczema Fungus: Field Survey will Seek Information in Relation to Disease

IN TENSITY of spore production by facial eczema fungus in pastures in a number of areas throughout the country is to be assessed in the coming summer and autumn by field officers of the Department of Agriculture.

It is known from recent advances in research into the disease that the spores will cause facial eczema in stock grazing pastures in which the fungus is present.

Investigations at the Department's facial eczema research area at Manutuke, near Gisborne, and elsewhere suggest that as spore production increases, likelihood of outbreaks of the disease also increases. The field survey has been planned to supply further information for this line of inquiry; to see if the assumption can be substantiated, and if it can, to see if it is likely to be of any use as a basis for improving the methods of predicting and defining the danger periods.

Equipment specially designed by the Plant Diseases Division of the Department of Scientific and Industrial Research in Auckland for collecting the spores from pastures will be used by field officers for the survey. Spore samples taken in the field will be sent to the Department of Agriculture's Seed Testing Station for counting under the microscope and if samples from any field officer show a tendency for spore numbers to increase, the frequency of sampling will be increased immediately so that the fullest possible data on behaviour of the fungus and spores under natural field grazing conditions can be secured.

The investigation will begin in November and carry through to the end of April, which covers the limits of the season in which facial eczema has been known to occur.

Aphid Resistant Rape

SINCE publication of the article "Aphis Resistant Rape" by T. P. Palmer in our October issue we have been advised by Crop Research Division of the Department of Scientific and Industrial Research that the term aphid is more commonly used than the term aphis and it has been decided to call the new variety Aphid Resistant rape.

Dr J. F. Filmer's Service to Animal Research

IN his 22 years as Director of the Animal Research Division of the Department of Agriculture, a position from which he retired last month, Dr J. F. Filmer made notable contributions not only in the field of research in which he was particularly qualified and interested, but also in many other activities that promoted the advancement of the science and practice of farming in New Zealand.

TRIBUTES to his work as a veterinarian and scientist, to his organisation of a division comprising animal research stations whose work has won wide recognition both in New Zealand and abroad, and to his qualities as an administrator and adviser were paid at several functions marking his retirement.

Before he came to New Zealand in 1938 John Filmer was already distinguished for his veterinary and research work in Australia. Born in Victoria in 1895, he spent much of his early life in Western Australia, where his father was in veterinary practice. On a scholarship won in Perth he went to Melbourne Veterinary School and graduated B.V.Sc. there in 1916. He served as a veterinary officer in the First World War and was discharged in 1919 with the rank of captain.

On his return to Australia he married and was in private veterinary practice in Western Australia until 1925, when he joined the Department of Agriculture there as a senior veterinary surgeon. In 1936 he went to Victoria as veterinary research officer to the Western District Research Association.

Major Research on Cobalt

His first major research in Australia concerned a disease affecting sheep and cattle in the Denmark district of Western Australia. The condition was similar to the bush sickness that was then a serious problem in New Zealand, and like bush sickness it responded to treatment with iron oxide ore. Observation that the amount of iron needed to cure an animal was far more than the normal needs of the animal for that element led Filmer and E. J. Underwood, with whom he was associated in the research, to postulate that some impurity in the ore was responsible for the cures, and they finally showed that this was cobalt.

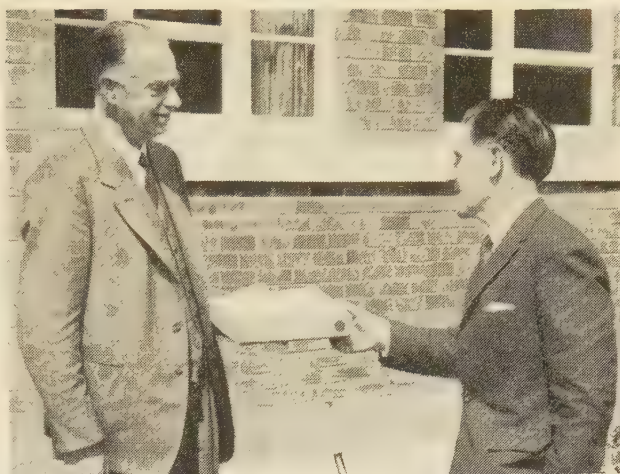
The discovery that cobalt was an essential nutrient for ruminants has proved of inestimable value, for the need for it has been found in virtually every country where sheep are raised. The initial research led to rapid growth of knowledge on cobalt and vitamin B₁₂ and the influence of this vitamin on the nutrition of both ruminants and non-ruminants. For a thesis on his work on cobalt deficiency Melbourne University conferred on Filmer the degree of Doctor of Veterinary Science shortly after he joined the then Wallaceville Veterinary Laboratory as a Veterinary Research Officer in February 1938.

Animal Research Director

Dr Filmer's appointment as Director of the new Animal Research Division of the Department in March 1939 called for high qualities as an administrator and subordination of his own capacity and talent for research to his job of stimulating the work of his staff and providing facilities. The Division started with the Wallaceville Station well established in the study of disease and with a new station at Ruakura to be built up to study the breeding and management of healthy animals. Under his direction smaller stations for special purposes were established at Mamaku for cobalt studies, at Kirwee for hogget mortality studies and lamb fattening trials, at Manutuke for facial eczema research, and at Whatawhata for research into sheep and cattle management on hill country.

The live, critical, and stimulating interest Dr Filmer has always taken in the work of all his officers has been a major factor in the success of his division. His arrival in New Zealand in 1938 coincided with a serious outbreak of facial eczema, investigation of which was one of his first responsibilities. He has taken a special place in subsequent work on the disease and gave broad guidance not only to his own staff but to the many others who have contributed to facial eczema studies. The major discoveries of the cause of the disease by a fungus and identification of the causal poison were made while he was still guiding the facial eczema team.

He was elected an honorary associate of the Royal College of Veterinary Surgeons in 1954 in recognition of his contribution to veterinary science by



An album of photographic records of the Division he directed being presented to Dr Filmer (left) by Dr M. B. Buddle, Director of the Wallaceville Animal Research Station.

his own research and his administrative guidance.

Wide Field of Service

The Public Service Commission's appreciation of Dr Filmer's work was expressed at a farewell function at Wallaceville by the chairman, Mr L. A. Atkinson, who said that extremely valuable work had been done, and would continue to be done, by the team he had built up. He could vacate his office with the feeling that his 22 years in New Zealand had been really worth while in that he had made a contribution to the country's prosperity that did not fall to the lot of many people.

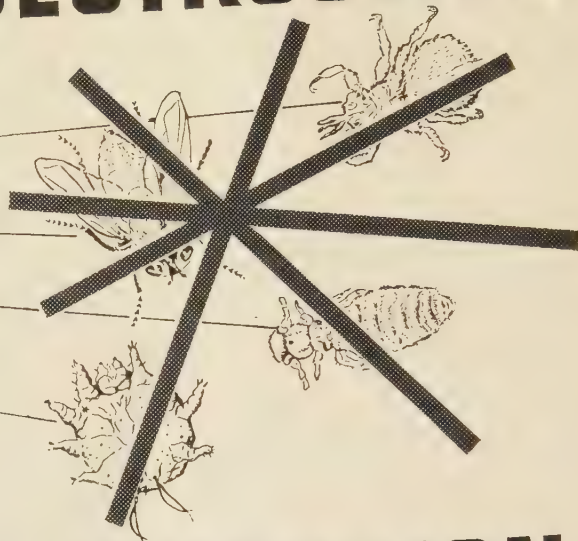
Dr Filmer's influence on the advancement of farming by his activities beyond the narrower field of animal research was referred to by the Director-General of Agriculture, Mr P. W. Smallfield, in expressing appreciation of Dr Filmer's assistance to himself and the Minister of Agriculture as a divisional Director and in the general administration of the Department. His work with other people in establishing the Society of Animal Production was a very important contribution to scientific research in New Zealand, as the free expression of scientific thought would always be essential to progress. His great interest in the New Zealand Grassland Association was recognised by his election to its presidency in 1955. His service on a number of boards and committees and in a host of other jobs had contributed a great deal to farming and had been of great benefit to the Department.

Good wishes of departmental staff in Dr Filmer's retirement were expressed in the presentation of a cheque.

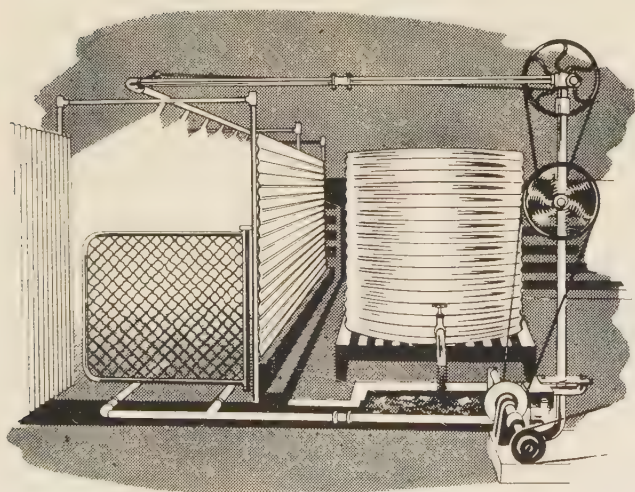
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Role of Trace Elements in Nutrition of Grazing Animals in New Zealand

The third article in a series by J. F. FILMER,
formerly Director, Animal Research Division,
Department of Agriculture, Wellington

A SUMMING UP OF RESEARCH

EVER since it was shown nearly 40 years ago that bush sickness was due to a mineral deficiency there has been keen interest in the role of minerals in animal nutrition in New Zealand. It has often been suggested that comprehensive analyses should be made of soils, plants, and animal tissues to determine how plants and animals react to varying concentrations of each of the elements in the soil. At first glance this would appear to be a logical approach which would be bound to produce very valuable results. In fact, much work has been done along these lines both in New Zealand and overseas. As a result, it is now known that 34 elements are constantly present in the tissues and fluids of plants and animals and that four other elements are sometimes present. Of these 38 elements, 27 are present in relatively small amounts and are known as trace elements. However, only seven of these trace elements have been shown to be essential to animals. They are iron, copper, manganese, zinc, iodine, cobalt, and selenium.



UPPER—Young stock reared successfully on what was at one time very cobalt deficient land.

BELOW—Sheep being farmed on land that was once cobalt deficient.



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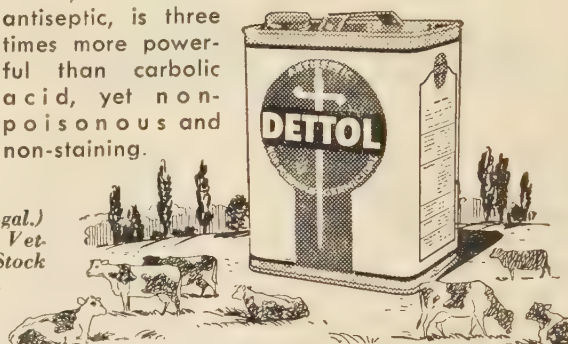
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IT may well be that some of the other 20 trace elements are also essential. However, it is known that wide variations in the concentration of some of them have no noticeable effects on the health and thrift of animals and some animals can live quite normally without any measurable traces of some of these elements. It is therefore unlikely that the results would justify the enormous amount of work that would be involved in a comprehensive analytical survey of all the trace elements in New Zealand soils, plants, and animals.

In New Zealand it has been shown that grazing animals in some areas require more cobalt, copper, iodine, or selenium than they can obtain from pasture. Poultry occasionally require supplements of manganese.

It is of course possible that deficiencies of some of the other trace elements may be affecting the thrift or health of New Zealand livestock, and research workers are constantly on the alert for any evidence of such further deficiencies.

This article deals with the known trace element deficiencies affecting grazing animals and shows how they can be diagnosed and corrected.

Diagnosis

Some of the trace elements are injurious to farm animals and they all cost money. It is therefore most unwise to administer them indiscriminately when no specific deficiency has been diagnosed. Reliable methods of

▼ Undosed (left) and dosed (right) lambs kept under otherwise identical conditions in a cobalt dosing trial by Wallaceville Animal Research Station.

diagnosis are available for all of the known trace element deficiencies in New Zealand and officers of the Department of Agriculture will help farmers where deficiencies are suspected.

COBALT DEFICIENCY

In the North Island, cobalt deficiency occurs to a varying degree in a large proportion of the extensive area covered by the various pumice showers. In the South Island, cobalt deficiency occurs on light, free draining soils in the Nelson Province, the West Coast, and the Morton Mains district of Southland. Marginal deficiency is also encountered on light stony soils in the Wairarapa and Canterbury districts. Not all farms are affected in the areas mentioned and isolated farms may be affected outside these areas. In collaboration with the Soil Bureau of the Department of Scientific and Industrial Research the Department of Agriculture has prepared a map showing the association of cobalt deficiency with soil types.

Susceptible Animals

Extreme deficiency of cobalt affects sheep and cattle of all ages. Sheep, however, are much more susceptible than cattle, and young animals are more susceptible than mature animals of the same species.

Symptoms and Diagnosis

Cobalt deficiency causes lack of appetite and if the deficiency is severe,

affected animals lose condition and eventually die in an extremely emaciated state. In arriving at a correct diagnosis it is important to remember the relative susceptibility of sheep and cattle of different ages. The most susceptible are weaned lambs and then follow older sheep, weaned calves, and older cattle. Unweaned lambs and calves seldom show obvious symptoms unless their dams are affected.

It thus follows that on a very deficient area sheep and cattle of all ages may be affected. On a moderately deficient area mature cattle may maintain condition but fail to milk well, while calves and sheep of all ages lose condition and die.

On a less deficient area a proportion of weaned lambs may be lost while young lambs and ewes and cattle of all ages appear normal.

On areas where deficiency is only marginal, no deaths may occur but weaned lambs fail to thrive. On such areas the effects may be seen only in some seasons. If weaned lambs are more thrifty than other stock grazing on the same area, cobalt deficiency need not be considered.

The estimation of cobalt in livers from affected animals and in pasture on which they became affected may help in arriving at a correct diagnosis, but cobalt analyses are time consuming and costly and can give misleading results. The estimation of vitamin B₁₂ in livers is probably more reliable. However, a simple dosing trial gives more convincing evidence and is very easy to carry out. Departmental officers will assist in conducting such trials.



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Control Measures

Affected animals can readily be cured and further trouble can be prevented by the regular administration of cobalt. On country where topdressing is normally practised the simplest control measure is the use of cobaltised superphosphate.

In the North Island this contains 3 lb of cobalt sulphate to the ton. Two hundredweight of this mixture contains about 5 oz of cobalt sulphate and this amount per acre if applied annually in autumn to all paddocks will control cobalt deficiency in the most severely affected areas.

In the South Island cobaltised superphosphate contains double the concentration of cobalt and 1 cwt per acre is adequate.

In areas where autumn and winter growth is poor, spring dressings may give better results. It is essential that all cobalt deficient paddocks should be topdressed with cobalt regularly. The rotation of stock through paddocks only some of which have been topdressed with cobalt cannot be relied on to prevent cobalt deficiency.

Topdressing at the above levels has completely controlled cobalt deficiency even in severely deficient areas when all paddocks grazed by susceptible stock were topdressed annually. These rates are not adequate if topdressing is applied at longer intervals.

On hill country the application of 20 oz of cobalt sulphate per acre maintains an adequate level of cobalt for about three years, and on some flat country it has maintained a safe level for even longer. Cobalt can be applied to pasture quite satisfactorily in solution either from the air or by any of the types of spray apparatus used for weed control.

Where topdressing or spraying is not feasible, cobalt can be supplied in drenches, licks, or "bullets". One drench may be indicated if lambs are already affected, but routine drenching is not very practicable, as to obtain the best results drenches must be given weekly.

Licks are satisfactory if all stock eat sufficient of them. In practice this seldom happens and a considerable proportion of the flock may not get enough cobalt to protect them.

Cobalt bullets are being tried in New Zealand. They are supposed to stay in the rumen for long periods, during which cobalt is dissolved from them slowly. In practice this happens in a considerable proportion of sheep and cattle. In quite an appreciable percentage, however, the bullets are lost and sometimes become coated with a deposit which may reduce the availability of cobalt. The Department of Agriculture is using bullets in extensive diagnostic trials. Until the results of these are known they cannot be recommended for control without some reservations.

COPPER DEFICIENCY

In New Zealand copper deficiency occurs both with and without excess of molybdenum.

Affected Areas

By correlating available data concerning stock health and copper and molybdenum status of pastures as determined by analysis with soil types it has been possible to map the areas on which copper deficiency and molybdenum poisoning are likely to occur.

Affected soil types have been itemised in the Department of Agriculture's Bulletin No. 238 and they are charted on a special map supplied to Departmental officers.

Susceptible Animals

In New Zealand cattle and sheep suffer from both simple copper deficiency and copper deficiency complicated by excess of molybdenum. Pigs are sometimes affected by copper deficiency. In Australia copper deficiency has caused disease in horses.

Symptoms and Diagnosis

Simple Copper Deficiency in Cattle

Calves grow slowly and adult cattle remain in poor condition. There is a tendency for the coat colour to be bleached. Some calves develop a form of staggers in which they are unable to control their hind legs.

Copper Deficiency with Excess of Molybdenum in Cattle

The main symptom is a profuse watery scour, especially in spring, but also to a less extent in autumn. In cows there is a marked loss of condition and production is lowered. Calves and yearlings are even more severely affected and in some areas it is impossible to rear replacements. Bone fragility may develop in calves and fractures are common. In black cattle

the coat colour may change to grey, especially round the eyes.

Symptoms in Sheep

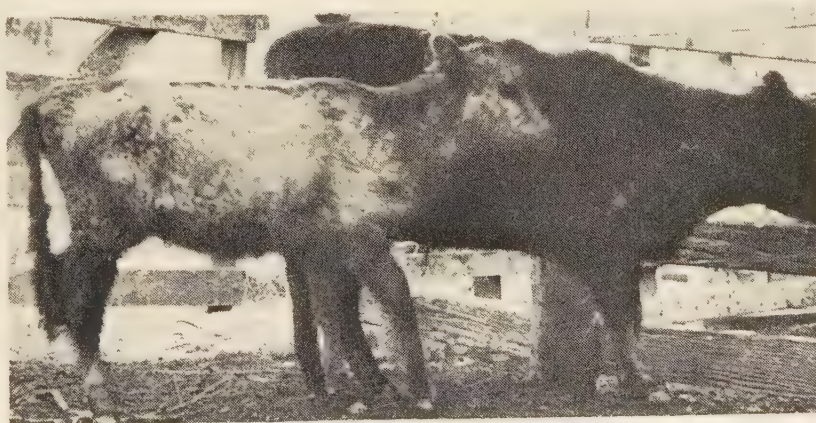
Adult sheep rarely show any symptoms even if kept for long periods on copper deficient areas with or without molybdenum excess. When ewes are brought on to such country from unaffected areas the first crop of lambs is generally healthy, but from each succeeding crop an increasing percentage of lambs is affected. They show bone fragility and a condition known as ataxia.

Affected lambs have difficulty in controlling their legs, the hind ones usually being worst affected. In very severe cases lambs may be unable to walk normally from birth. More usually the condition is first noted when lambs are from two to four months old. In very mild cases staggering may develop only after the lambs have been driven for some distance. Provided lambs can move sufficiently to suckle and graze they may grow normally and even fatten. More severely affected lambs fail to grow and may die from starvation. Lambs which do not become ataxic, with few exceptions, grow quite normally on deficient areas.

It will be noted that in copper deficiency mature sheep and some lambs remain healthy on areas where cattle of all ages are affected. This is in marked contrast to cobalt deficiency.

Copper Poisoning in Sheep

Sheep which receive more copper than they require store the excess in the liver until a concentration of up to ten times normal is reached. While this is going on the sheep remain quite healthy. However, if such animals are subjected to a lowered plane of nutrition or some other unusual stress, the copper is released from the liver into the blood stream where the red cells are destroyed and the sheep develop jaundice and red-water and die after a few days. This condition occasionally occurs when the



Where copper deficiency is associated with excess of molybdenum in cattle the coat colour may change from black to grey.



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copper intake is within normal limits. In Australia a poisonous plant causes unusual copper storage in the liver. In New Zealand the factor responsible has not been determined.

Molybdenum Topdressing

The spectacular improvement in pasture growth obtained from topdressing with small amounts of molybdenum in some areas has naturally aroused great interest. However, it is important to remember that molybdenum is toxic to both cattle and sheep, especially if the pasture is deficient in copper. Molybdenum should therefore be used only where it is required and then only in the recommended amounts.

Control of Copper Deficiency

Where topdressing is normally practised the best way to correct copper deficiency is to include copper sulphate in the fertiliser. Copperised superphosphate is available and when applied annually at the rate of 2 cwt per acre will control copper deficiency in both sheep and cattle.

Licks are satisfactory if all stock eat adequate quantities. Because sheep are more susceptible to copper poisoning than cattle, the concentration of copper in sheep licks is less than in cattle licks. Any lick registered by the Stock Remedies Board will contain the correct concentration. This should not be exceeded, especially for sheep, or copper poisoning may result.

Where topdressing is not feasible and stock do not eat licks readily, cattle can be protected during spring by one injection of a copper mixture. Similarly one injection into pregnant ewes will protect their lambs from developing ataxia. Veterinary advice should be sought before using injections.

IODINE DEFICIENCY AND GOITRE

In some districts in New Zealand a proportion of lambs are born with enlarged thyroid glands. This is more likely to occur when pregnant ewes have been grazed on brassica crops such as kale, chou moellier, and swedes. It is likely that in these cases the trouble is due to a goitre-producing substance in the plants rather than to a deficiency in iodine.

However, the trouble can be prevented by administering one drench containing 280 mg of potassium iodide three months after tupping and a similar drench one month later. There is some evidence that similar results can be obtained by one injection of 1 cc of iodinated poppy seed oil containing 40 per cent of iodine three months after tupping. Iodised licks containing 5 oz of potassium iodate per ton are sometimes used, but are not as reliable as the above treatments.

Calves and foals are sometimes born with goitre and it is likely that this could be prevented by treating cows and mares with the appropriate doses of iodine. There is no evidence that iodine supplements are of any value in New Zealand except for the prevention of goitre in new-born animals.

SELENIUM DEFICIENCY

The last element which has been proved essential in animal nutrition is selenium. Until very recently this element was known to agricultural scientists only as a poison. However, a few years ago American workers found that selenium could replace vitamin E in certain deficient diets. Since then it has been shown that selenium can play a very important role in maintaining the health and production of sheep and probably cattle in some districts in New Zealand.

Affected Areas

Affected areas have not yet been mapped with any certainty. Positive results have been achieved with selenium supplements in pumice areas in the Rotorua-Taupo district and on some light, free draining soils on the west coast of the North Island and in parts of Canterbury, Otago, and Southland.

Susceptible Animals

So far responses to selenium have been obtained in ewes, lambs, and calves.

Symptoms and Diagnosis

The conditions which have responded to dosing with selenium are white muscle disease, one form of ill thrift, and a low lambing percentage which may occur on the same farms as these conditions.

White muscle disease is characterised by a muscular degeneration which may affect muscles of the legs or the heart. Where the leg muscles are affected the lambs or calves tire easily and, especially if they are hurried, soon stagger and fall. White muscle disease most frequently develops in lambs between marking and weaning. It may, however, develop later, especially in hoggets being wintered on swedes. Occasionally lambs are affected at birth, and where the heart muscles are affected they may be born dead.

Unthriftiness which responds to selenium usually manifests itself before weaning but becomes worse after weaning. There is some suggestion that selenium has a specific effect on wool growth, as treated sheep have grown more wool than untreated controls even when there was little or no difference in body weights.

TRACE ELEMENTS

In some affected areas the lambing rates have been depressed to 50 per cent or even less.

Methods of Control

Selenium so far has been administered in drenches or injections. It must not be forgotten that selenium is very poisonous. Moreover some species of plants accumulate selenium until it reaches a concentration hundreds of times greater than in the soil on which they are growing. In the present state of our knowledge it would not be safe to apply selenium as a topdressing. It would also be risky to put it in licks, because some sheep might consume toxic quantities while others would eat none.

Many experiments are being conducted with selenium with a view to determining the areas in which it is likely to be beneficial and the best methods of administering it. It may be several years before the complete answers to these questions are available. In the meantime the following tentative recommendations are based on the knowledge already accumulated.

To prevent white muscle disease in lambs give one dose of selenium to ewes one month before lambing and one dose to lambs at docking.

To increase lambing percentage give doses of selenium one month before tupping, two months later, and one month before lambing. Rams should be treated one month before tupping.

To control unthriftiness in lambs or calves give one dose of selenium as soon as trouble is noticed and repeat at two to three month intervals.

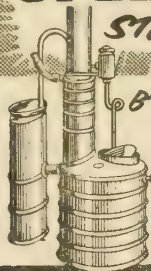
It must be emphasised that positive results cannot be expected in all areas. Selenium cannot be obtained without a veterinary prescription. Therefore, wherever selenium deficiency is suspected veterinary aid should be sought to obtain a proper diagnosis and to ensure that correct doses are given.

CONCLUSION

The trace element deficiencies which are known to exist in New Zealand produce characteristic symptoms and can be diagnosed with considerable accuracy.

Farmers who suspect that their stock are suffering from a mineral deficiency should seek assistance from veterinarians or farm advisory officers toward making an accurate diagnosis. When this has been made the appropriate control measures can be adopted. This procedure is likely to prove much more satisfactory than using blunderbuss mixtures in drenches, licks, or fertilisers.

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Agricultural Talks between U.K. and N.Z. are Important to our Economy

By J. B. QUIGG,
Investigating Officer, Department of Agriculture, Wellington

PROTECTION to United Kingdom farmers was established in a programme of tariffs, subsidies, and quotas introduced in 1931. The principle of direct State encouragement and aid was confirmed in legislation since, and agriculture in the United Kingdom continues to receive substantial assistance from the Government. This article outlines the present position, which has particular significance in relation to the talks on agricultural policies between the United Kingdom and New Zealand which are held each year in November.

THE United Kingdom has always been New Zealand's principal export market. In fact primarily because of the existence of the United Kingdom as an outlet for our exports New Zealand has been able to concentrate production on a limited range of livestock products where her natural advantages are greatest. This fact has largely governed the pace of our economic development and has led to the high standard of living we now

enjoy. In 1959 overseas exchange earned from exports amounted to £305.9 million. Of this, £173.4 million, or 57 per cent, was earned by sales in the United Kingdom.

In 1932 the United Kingdom and New Zealand Governments completed what is known as the Ottawa Agreement. This agreement formally recognised the mutual benefits to be derived from existing trade and the two coun-

tries extended to one another certain concessions on a reciprocal basis.

Trading relations between the two countries were further cemented by the bulk-purchase contracts for meat and dairy produce which operated throughout the war and post-war years until their termination in 1954.

Annual Agricultural Consultations

With the passage of time and changes in the pattern of world trade, the balance of advantage under the Ottawa Agreement moved against New Zealand. Trade discussions between the two countries were therefore held

HEADING PHOTOGRAPH: Many British farms are run on a small scale, and Government assistance has been designed to encourage small farmers to take advantage of modern knowledge and practice. A farmer's wife on such a farm is shown above rolling fleeces as they are hand sheared by her husband on a farm in Westmorland.

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in 1957 and the outcome was a further agreement supplementing that of 1932. Among other things this agreement provided for annual consultations on agricultural policies between the two countries.

In 1958 the United Kingdom-New Zealand Trade Agreement of 1932 was revised and the new agreement, which came into force on 25 November of that year, incorporates the provision included in the 1957 supplemental agreement that:

"Full consultation between the United Kingdom Government and the New Zealand Government shall . . . take place in respect of their agricultural production and marketing policies, the food import policy of the United Kingdom Government, and other related matters. The two Governments will in each year exchange statements of agricultural trends; and each will give full weight to the views of the other in the formulation of their production, marketing, and import policies relating to agriculture."

To give effect to the above provisions the agreement provides that representatives of the two Governments will meet each year in November. At the request of either Government additional meetings may also be held. The first annual consultations were held in the United Kingdom in November-December 1957. This year's talks are being held in London this month.

These annual consultations are significant from New Zealand's point of view, as they give us the opportunity to comment, not only on the United Kingdom Government's food import policy, but also on its agricultural

production and marketing policies. The latter are important, because New Zealand's principal competitor in the United Kingdom market for meat and dairy produce is the United Kingdom's domestic agricultural industry.

Agricultural Production in the U.K.

An article in the August 1957 issue of the "Journal" described the various forms of assistance given to farmers in the United Kingdom. The extent of this assistance largely determines the level of the United Kingdom's own production and hence the present state of the market. The remainder of this article therefore summarises the present position regarding Government assistance.

Though the United Kingdom provides a market for the greater part of New Zealand's exports of agricultural products, her domestic production is very large, indeed much larger than that of New Zealand in many commodities. Latest available illustrative statistics are given in Table 1.

Agricultural production has increased steadily in the post-war period and is now estimated to be about 68 per cent greater than it was before the war. Present Government policy is that no further expansion in gross output is required. Rather, the Government considers that the industry must increasingly turn its attention to reducing unit costs of production and to getting the best returns from the market.

Guarantee Policy

The Government can influence production through its guarantee policy as laid down in the Agriculture Acts

. . . BRITISH AGRICULTURE

TABLE 1—ESTIMATED AGRICULTURAL PRODUCTION IN U.K. AND N.Z.

	United Kingdom	New Zealand	United Kingdom	New Zealand
	acres ('000)	acres ('000)	tons ('000)	tons ('000)
Crops				
Wheat ..	1,928	161	2,787	224
Barley ..	3,073	62	4,036	75
Oats ..	2,032	33	2,186	31
Potatoes ..	817	24	6,850	150
Sugar beet	435	—	5,328	—
Livestock products				
Beef and veal ..			770	249
Mutton and lamb ..			241	430
Pig meat ..			695	40
Wool ..			37	252
Milk (million gallons) ..			2,264	1,162

(Sources: Annual Review and Determination of Guarantees, 1960; Abstract of Statistics; Department of Agriculture.)

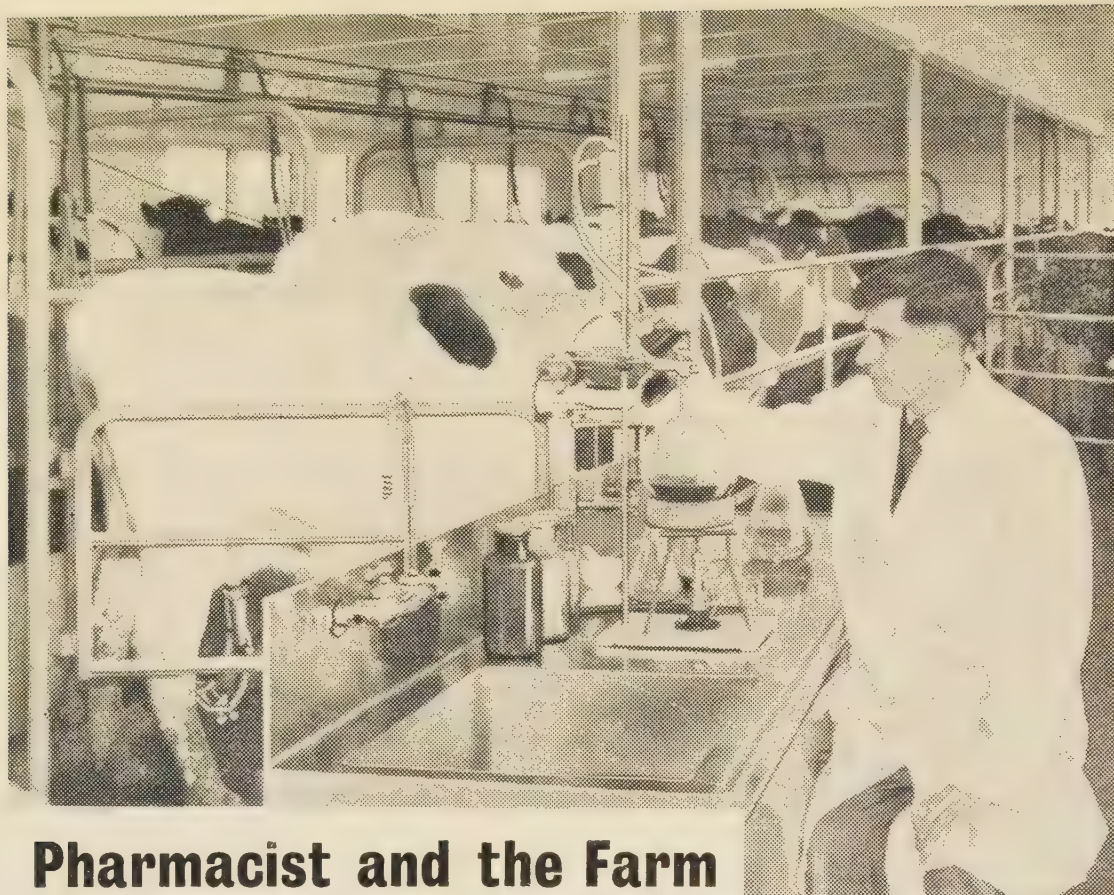
of 1947 and 1957. The purpose of the policy as stated in the 1947 Act is the establishment of stability for agriculture as a whole, and the main method used to this end is the payment of guaranteed prices to producers.

The approach to the determination of the guarantees is that each year representatives of Government and the Farmers' Unions meet in formal discussion. As a first step a statement is made regarding future Government production policy, which takes account of the world supply position and prevailing economic conditions.

The objective is then to arrive at an assessment of the total increase or decrease which should be made in farmers' gross receipts (treating the United Kingdom as one large farm) to enable the industry to reach the



Farming in Britain has become highly mechanised, Government guarantees having encouraged farmers to invest extensively in capital equipment. The tractor density there has reached the level of one tractor to 45 acres of arable land—the highest in the world.



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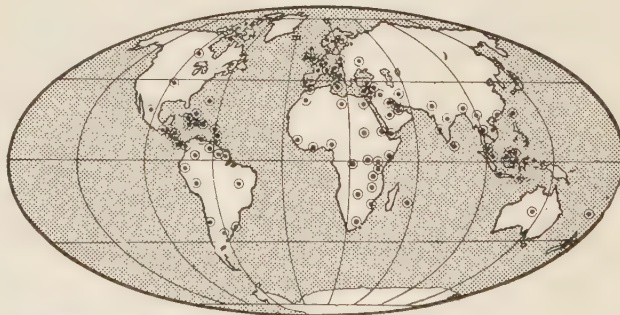
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goals set for it with the highest possible level of efficiency. The resultant overall figure is translated into suitable adjustments to commodity prices, account being taken at this stage of statistical evidence of the relative profitability of various types of farming. It is not essential that the discussions should result in agreement; the ultimate determination of the guarantees is the sole responsibility of the Government.

The 1957 Act specifies that the total value of the guarantees (including various direct production grants) in any one year shall not fall below 97½ per cent of the previous year's total after allowance is made for cost changes that have occurred on review commodities since the last Annual Review. The guaranteed price for each commodity must be maintained at not less than 96 per cent of the corresponding price determined after the last Annual Review. In addition the guaranteed prices for livestock and livestock products may not be reduced by more than 9 per cent in any three years.

These provisions assure farmers that they will not be subject to drastic price cuts even if world agricultural prices are falling rapidly.

The previous article on this subject gave the guaranteed prices paid for a number of years. Table 2 gives the prices determined after the 1960 Annual Review and which relate to 1960-61, except for crops, the prices for which are those for the 1960 harvest.

TABLE 2—GUARANTEED PRICES IN U.K.

Commodity	Unit	s.	d.
Wheat	cwt	26	11
Rye	cwt	21	7
Barley	cwt	28	9
Oats	cwt	27	2
Potatoes	ton	260	0
Sugar beet	ton; 16.5 per cent sugar content	128	0
Fat cattle	live cwt gross weight	157	0
Fat sheep and lambs	pound estimated dressed carcass weight	3	3
Fat pigs	score dead weight	45	10*
Milk	gallon	3	1.45
Eggs, hen	dozen	3	11.15†
Eggs, duck	dozen	2	5.58†
Wool, greasy	pound	4	5.25

* Related to a feed price of 27s. 1d. per cwt.

† Related to a feed price of 26s. 5d. per cwt.

(Source: Annual Review and Determination of Guarantees, 1960.)

In addition to the assistance afforded under guarantee payments, farmers in the United Kingdom receive substantial aid in the form of grants and subsidies. Since the last "Journal" article on this subject was published an additional form of assistance designed to help the small farmer has been introduced. The objectives and nature of the help were outlined in a Government White Paper "Assistance for Small Farmers", issued in October 1958.



As part of the advanced technical development of agriculture in Britain aircraft have been brought into farming operations similarly to the way they are being used in New Zealand. This helicopter is spraying fungicide over a potato field in Norfolk.

Assistance for Small Farmers

The White Paper mentioned that a main objective of the Government's agricultural production policy is to foster steady improvement in the industry's competitive position. In this respect the small farmer requires special consideration, because he faces greater difficulty in securing the resources necessary to adapt his methods and production generally toward achieving the higher standards of efficiency and of management required. The Government considered that a special drive was required to encourage small farmers to take advantage of modern knowledge and practice supported by the provision of initial working capital to make such a drive effective.

The proposals outlined were:

1. A Small Farmer Scheme, and
2. A Supplementary Scheme.

The Small Farmer Scheme, which came into operation on 1 April 1959, is intended to help those farm businesses that are economic in the sense that they are capable, with reasonable management, of giving remunerative full-time employment to the average occupier. A combination of two tests is used to decide farmers' eligibility. These are:

- (a) The farm business must have not less than 20 and not more than 100 acres of crops and grass (other than rough grazing).
- (b) The farm business must be judged capable of reaching standard labour requirements of at least 275 standard man-days after completion of a proposed farm busi-

ness plan. A standard man-day represents 8 hours' manual work for an adult male worker under average conditions. It is assumed that farms with an existing labour requirement of 250 man-days are capable of reaching a figure of 275 man-days. Farm businesses with an existing labour requirement of more than 450 standard man-days are not eligible for assistance under the scheme.

To secure assistance applicants have to put forward plans for the improvement of their farm businesses over three to five years.

Eligible farms are entitled to two kinds of special grant—a farm business grant and field husbandry grants. The former is intended as a contribution toward the expense incurred on such items as the purchase of stock and equipment which are integral parts of an applicant's farm business plan. This grant is at a standard rate of £6 per acre of crops and grass (excluding rough grazing) with a maximum of £360 per farm.

A field husbandry grant is payable in respect of particular groups of field operations included in the plan and primarily for the improvement of land under grass. The total assistance payable under both headings is limited to £1,000.

The Supplementary Scheme is designed to provide for interim assistance to small farmers for whom approved farm business plans are not immediately practicable. It is to be used also to provide temporary assistance for three years to ease the position of some of those farmers who were receiving assistance under

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Marginal Production Schemes (which are being revised or replaced) but who will not be eligible for the Small Farmer Scheme. Assistance is mainly in the form of special grants supplementary to the payments made under the existing schemes for contributions toward the cost of ploughing, liming, ditching, and the supply of fertilisers.

The necessary finance for the new grants is provided within the total of the guarantees given to the industry.

Cost of Assistance

For the year ended 31 May 1960 it is estimated that aggregate farming net income in the United Kingdom was £356.5 million. The estimated cost of Exchequer support to agriculture for the year ended 31 March 1960 was £259.1 million, details of which are given in Table 3. Government therefore contributed about 72 per cent of

TABLE 3—ESTIMATED COST OF EXCHEQUER SUPPORT TO AGRICULTURE IN U.K., 1959-60

	£ million	£ million
I. Implementation of price guarantees		
Cereals:		
Wheat and rye ..	20.4	
Barley	25.1	
Oats and mixed corn ..	12.7	
		58.2
Potatoes	1.0	
Eggs, hen and duck ..	36.5	
Fatstock:		
Cattle	3.4	
Sheep	25.9	
Pigs	21.3	
		50.6
Milk (excluding school and welfare milk) ..	8.5	
Wool	3.0	
Total (1)		157.8
2. Farming grants and subsidies		
Fertilisers subsidy	29.0	
Lime subsidy	11.0	
Ploughing grants	9.3	
Field drainage grants (tilling, mowing, and ditching)	2.3	
Water supply grants	0.8	
Grants for improvement of livestock rearing land	1.5	
Marginal Production Assistance grants	1.7	
Bonus payments under the Tuberculosis (Attested Herds) Scheme	8.9	
Calf subsidy	16.4	
Hill cattle and hill cow subsidies ..	4.0	
Silo subsidies	1.4	
Grants for farm improvement	6.3	
Grants to small farmers	1.9	
Other grants (grants to producers in the Scottish Islands; grants to rabbit clearance societies; and grants for improvement of livestock)	0.1	
Total (2)		94.6
Totals (1) and (2)		252.4
Administrative overheads applicable to the foregoing expenditure		5.5
		257.9
3. Other services		
Arrangements for the benefit of agricultural producers in Northern Ireland financed from the U.K. Exchequer		1.2
Total estimated cost of agricultural support		259.1

(Source: Annual Review and Determination of Guarantees, 1960.)

the amount received by farmers for the manual and managerial labour expended by themselves and their wives and for the use of capital invested.

N.Z. Attitude to Government Assistance

As an agricultural country New Zealand is well aware of the reasons that may be advanced in support of a measure of assistance to agriculture. Some of these reasons we would not question. At the same time we take strong exception to the excessively high levels of protection accorded almost universally by the industrialised countries to their domestic agricultural industries.

The annual discussions between the United Kingdom and New Zealand Governments give New Zealand the opportunity of expressing her views on the various measures of Government assistance accorded agriculture in the United Kingdom. That the United Kingdom does give due consideration to these views is demonstrated by the following extract from the White Paper dealing with the 1960 review of guarantees:

"It is also desirable in the interests of trade relations, especially with the Commonwealth, to reduce the dependence of the industry on Exchequer support by discouraging the highest-cost production".

From New Zealand's point of view the system of support followed in the United Kingdom is less harmful to economic exporters of agricultural

. . . AGRICULTURAL TALKS

products such as New Zealand than other methods of assistance, because the price guarantees are implemented by deficiency payments under which the Government pays the deficit, if any, between the average market price realised and the guaranteed price.

With the exception of milk for consumption as whole milk the system avoids interference with free marketing in the sense of prescribing a price which must be paid or received in the market place. Such a system does not retard consumption, which is one of the effects of high support prices unrelated to the market. Further, the total cost of deficiency payments is readily ascertainable and is clearly identifiable as an item of Government expenditure which has to be paid by the general taxpayer in the interests of one sector of the economy.

A system of deficiency payments also has an advantage in that it is possible to identify the degree of assistance being accorded specific products in relation to one another. This information, considered in relation to production trends and the availability of imports, is valuable in suggesting where adjustments in support levels would be most desirable. Further, any adjustment in the guaranteed price level in respect of a commodity, for example, the reduction in the price for fat sheep and lambs from 3s. 3½d. to 3s. 3d. at the 1960 Annual Review, is an indication to farmers that their own production policies might require reconsideration.

Overwatering can Damage Crops

GROWN on land in good heart, all crops respond favourably to irrigation in dry seasons, but they can be seriously damaged by ill-timed and excessive application of water. Most failures result from irrigating too early or too heavily.

The rate of application by sprinkler irrigation should not exceed the absorptive power of the soil and only enough water to saturate the root zone should be applied.

Applications by surface methods are commonly excessive. The primary method of reducing the amount of water applied is by shortening the length of run of water. This should not exceed 10 chains and on very porous soils 5 chains is a better length. If the crop can be grown on ridges, danger of damage from too heavy or too early application of water is reduced.

For all crops the first irrigation should be delayed until plants are well established with five or six true leaves and preferably until the crop has covered the ground.

Cereal crops respond to irrigation from tillering to flowering. Spring-sown crops are generally more responsive than autumn-sown ones.

Linseed, peas, and potatoes respond best if irrigated when they are flowering.

All of the brassicas benefit from irrigation, but the leafy types such as kale and rape, and also soft turnips, are more easily damaged by overwatering than swedes.

Mangels and fodder beet can be very successfully irrigated as soon as plants are well established.

Crop responses to irrigation are obtained only if soil moisture is limiting plant growth and only then if other conditions are favourable. Adequate applications of fertilisers are essential and where possible surface cultivation should follow irrigation.

—B. A. LAUDER,
Farm Advisory Officer,
Department of Agriculture,
Ashburton

Care of Livestock during December

Contributed by the Animal Research Division

AS each lot of lambs is sold their mothers and any dry ewes that may remain in the flock should be drafted off. If feed is short and the ewes have very little milk,

CARE OF EWES AND FAT LAMBS

it usually pays to wean all the lambs, which can then be given the best grazing available. The ewes should be shorn and those which are to be retained may be placed on short pasture with ample water until flushing is started three weeks before tupping. Provided they are not allowed to lose too much condition, this procedure will result in a good lambing percentage in the following season.

This is the season in which plans for the eradication of foot rot must be made and farmers should follow the Department's published recommendations or seek advice from the Department's nearest office.

FOOT ROT CAN BE ERADICATED



The year's production can be materially affected by feed conditions during summer.

DAIRY COW NUTRITION

Cows fed poorly now not only produce less milk during summer, but will dry off earlier in autumn. Dairy

statistics show that long lactation is very important, so the feeding of silage or other supplementary milk-producing fodders should be started as soon as pasture begins to dry off. This should not be left until milk production shows a material fall.

If cows are returning to service, the mating records should be examined to see if any particular bull is to blame. If so, a veterinarian or Livestock Instructor should collect a semen sample for examination. Care is necessary when a replacement bull is bought, and if possible, it should be a young bull that has not been used previously. A bull should never be bought in the saleyard unless his full history is known.

Washing out cows seldom helps and may cause trouble if irritant fluids such as kerosene are used. It pays to consult a veterinarian as soon as the cows are noticed returning to service in unusual numbers; he cannot be expected to diagnose the trouble months later.

Infection with *Leptospira pomona* can cause abortion in cattle and redwater in calves. Both of these diseases may be prevented by vaccination of the pregnant cow. Cows vaccinated early in pregnancy and again about two to four weeks before calving may be protected against this particular type of abortion and at the same time protection may be conferred on the calf against redwater through the colostrum. A veterinary surgeon should be consulted to establish a diagnosis of leptospirosis and to undertake control measures.

LEPTOSPIROSIS IN CATTLE

Vaccination of Calves against Contagious Abortion

THOUGH the vaccination of calves against contagious abortion is now widely accepted as a routine procedure, some farmers are surprisingly still unaware of it.

The usual method of vaccination is the injection of 5 c.c. of vaccine under the skin of the neck or behind the shoulder, where the skin is slack enough to accommodate a large volume of fluid without undue tension. The treatment is given when the calves are between four and eight months of age. Poor immunity results from vaccination before this age.

The immediate after effects of vaccination are slight. Some calves are a little off colour for a few days and occasionally cold abscesses form at the site of inoculation, but if left alone, they will disappear, leaving a lump which also gradually decreases.

Vaccination bookings should be made early through a Department of Agriculture officer or veterinarian, as a heavy programme starting in January and February has to be arranged.

If ewes with lambs are to be shorn, every effort must be made to reduce the time during which lambs are away from the ewes, as it is easy to dry ewes off at this time of the year. They should be brought to the shed in small mobs and should be dagged before reaching the board.



Farrowed sows should receive a ration of 4 gallons of milk plus 2/3

gallon per pig suckled. Newly

weaned pigs should not receive excessive quantities of by-product; 1½ to 2 gallons per day in three

feeds is adequate for the first 14 days. The ration can then slowly be raised to 2½ gallons at the end of the first month, and after the first fortnight the number of feeds may be reduced to two per day.

Replacement breeding stock should be selected from the bacon pens and should be sired by a purebred boar of good carcass quality and from recorded stock. Those chosen should be the fastest-growing sows with good, strong feet and at least 12 well placed teats.

Seasonal Notes

By Farm Advisory Division

PASTURE TOPPING



IF dairy pastures run to stalk in November and December, they will require topping before the dry weather sets in. Early topping removes the stalks, stops the grass getting rank, and promotes the growth of high quality leaf.

After the paddock has been fed off, the mower should be set high and the paddock topped when rain is expected.

It is quite safe to cut stalky paspalum and other pastures later in summer if a soaking rain has already fallen. In very dry weather topping is not recommended, because then it opens up the ground when every drop of moisture should be conserved.

Stock will eat some of the wilted material and the remainder will cause no trouble if left to lie and rot. The stalks themselves are of low food value, but farmers with a forage harvester can make satisfactory hay or silage from leafy toppings.

The aim with topping is to carry a dense cover of well controlled pasture into summer to provide nutritious stock food and prevent excessive drying out of the soil.

—M. G. BOYER, *Te Awamutu*

* * *

SUMMER PASTURE MANAGEMENT

SEASONAL pasture management on dairy and sheep farms should aim at full control of late spring and summer growth through controlled grazing, topping, making hay and silage, or pasture seed production.

On well managed dairy farms as soon as pasture growth is in excess of stock requirements the grazing area is restricted by closing some of the paddocks so that stock fully control the growth on part of the farm while the surplus is saved in several paddocks. The surplus grass is removed as silage or hay while it is still good feed and the whole of the farm goes into the summer in good grazing order. The mower or forage harvester is also used for topping excess growth on grazed pastures to keep them in good order. The aim should be to top pastures early so that they will make satisfactory recovery before dry weather sets in; it is generally unwise to top after the middle of December.

Much the same methods can be used on fat-lamb farms. If the stock that are wintered plus the spring crop of lambs cannot cope with the flush of feed, the mower and cattle should be used to handle the surplus. Where pasture seeds can be harvested the closing of paddocks for seed and concentrating the stock on fewer paddocks will help to give control. Where this is not possible paddocks should be closed for silage or hay, which can be used for winter feed for cattle and sheep. On hill country the saving of surplus growth on a few selected paddocks by the removal of stock to adjacent paddocks during the flush period is well worth while. The grazed areas are kept in good order by the heavier stocking and the grass on the spelled areas, which is invaluable for weaned lambs, can be brought under control by cattle grazing later in the season.

—J. A. GRAHAM, *Palmerston North*

* * *

MAINTENANCE OF LUCERNE STANDS

MOST lucerne stands will have received their first cut by the end of this month. It is essential to remove the cut

material from the paddock as soon as possible after drying. If wet weather continues, it is desirable to sacrifice the crop rather than retard recovery growth of the stand. Aeration and weed control with the spring-tooth cultivator, using lucerne points, should be carried out immediately the first cut is removed. Chemicals should not be applied at this stage.

Phosphate and potash should be applied after the first cut at rates according to soil and crop requirement. Lime is best applied in autumn or winter.

—A. J. COUGHLAN, *Hastings*

* * *

BRASSICA CROPS FOR WINTER FEED



CLIMATE and soil fertility should govern selection of a brassica crop to provide palatable and succulent feed for stock during winter.

Where summers are generally hot and dry and soil fertility not very high, turnips will prove the most reliable. They may be sown from late December, but where there is risk of aphid infestation, and as a consequence virus disease, sowing should be delayed until late February and an early maturing variety such as York Globe sown.

In cooler, damper climates swedes are a reliable and high producing brassica, particularly if the soil is in good heart. Sowing should preferably be done in November or early December and if conditions are favourable growth will continue until early winter. Sensation and Calder are reasonably resistant to virus diseases and should be sown where aphid infestation is likely.

Chou moellier is suited to most conditions, but does best where the rainfall is adequate and soil fertility is high. It is resistant to virus disease and is a safe crop where winter snows are often likely. It may be sown from October, but if sheep feed is required January sowings are to be preferred.

—J. L. SYMONS, *Waimate*

* * *

BORON FOR SWEDES

MOTTLED heart or brown heart disease of swedes is caused by a soil deficiency of the trace element boron and may be prevented by applying boron in the form of commercial borax at time of sowing. The safest way to apply it is to broadcast it at 20 lb per acre mixed with some sand or manure before the crop is sown.

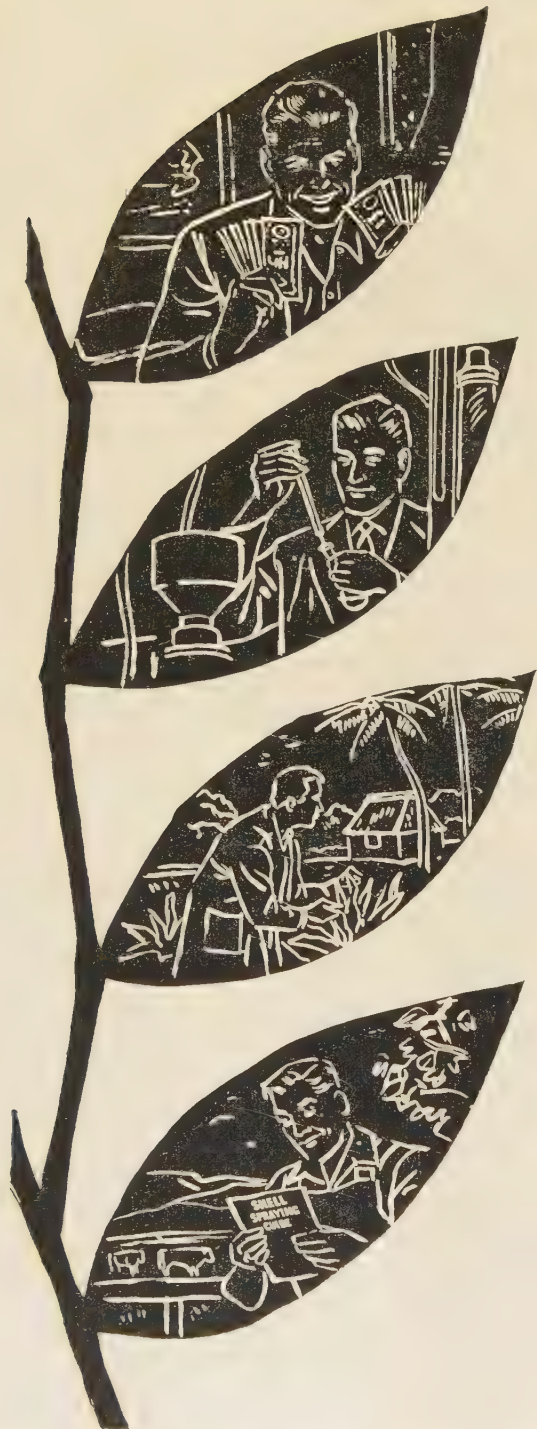
Borax should never be mixed with lime or quicklime for application, as these materials inactivate the borax. When mixed with the seed for broadcasting, or when swede seed is drilled in with borated manure, the mixture should not contain more than 2½ per cent of borax, as otherwise the seed might be injured.

Borated fertiliser mixtures now contain, instead of the soluble borax, insoluble fertiliser borate, which in trials has proved weight for weight as effective as borax in preventing mottled heart disease. Fertiliser borate is also available to farmers wishing to prepare their own mixtures. For drilling with swedes 8 lb of borate per acre should be sufficient. For broadcasting, about 15 lb to 20 lb of borate should be used, and farmers should make sure that the amount of fertiliser to be distributed per acre contains this amount; if not, stronger mixtures will have to be prepared on the farm.

—B. A. GUNNING, *Matamata*

♦♦

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The Problem of Feeding the World's Millions

By J. B. QUIGG,
Investigating Officer, Department of Agriculture,
Wellington

THE tenth anniversary of the inauguration of the Colombo Plan and the launching of the Freedom-from-Hunger Campaign by the Food and Agriculture Organization of the United Nations (FAO) which occurred this year serve to remind New Zealanders that in many of the less developed and more populous countries there is a degree of poverty that we can scarcely imagine. This article describes broadly the present world food situation, the contribution made in the past decade by the Colombo Plan toward solving the twin problems of poverty and hunger, the objects of the Freedom-from-Hunger Campaign, and the manner in which it is to be implemented.

World Food Situation

SINCE the war there has been an increasing tendency to regard the countries of the world as falling into two groups: those which are economically developed and those which are economically underdeveloped.

In developed countries the level of productivity reached makes it possible for the small percentage of the population engaged in agriculture to provide a nutritionally adequate diet for the rest of the population and to earn incomes far in advance of those of farmers in underdeveloped countries.

In underdeveloped countries, though a large part of their respective populations is engaged in agriculture, production is often too low to satisfy even the simple diets imposed by their general poverty. The post-war upsurge in population growth, due mainly to improved medical services and falling death rates, has accentuated the deficiencies in production in these countries.

In the less developed countries of the world agriculture is nearly always the main occupation, but most farmers know little of the methods which would increase productivity. In some areas almost purely subsistence farming is to be found, but the most common type of agriculture is the small holding worked primarily to feed the farmer's family, but producing also a small surplus to be sold or traded to pay taxes and other cash expenses and to obtain a few things which the farmer himself cannot produce.

The primitive methods of farming result not only in low productivity, but frequently in deterioration of soils and other natural resources. Concentration on a few basic commodities often results in lack of productive employment for fairly long periods and chronic under-employment.

Investment resources and credit facilities to finance improvements are grossly inadequate. The incentive to invest and improve productive capacity is diminished by insecurity of land tenure and the great instability of

agricultural prices. In short, the conditions in these countries give rise to the "circle of poverty", or the tendency of poverty to engender poverty.

The economically underdeveloped countries are those which comprise the greater part of Asia, Africa, and Latin America, the population of which in 1958 was over 2,000 million. Recent estimates by the United Nations indicate a further increase of the order of 1,000 million between 1958 and 1980. There must be at least a parallel growth in the food supplies of these regions if their diets are not to deteriorate further.

Food consumption levels in the underdeveloped countries are best appreciated by comparisons being made with those of the more developed areas. Standards of living, including food consumption, depend ultimately on levels of income. Table 1 gives per capita national incomes in some of the advanced countries of the western world and in some of the more populous countries of Asia, Africa, and Latin America. Also shown in the table is the percentage of the population dependent on agriculture.

TABLE 1—NATIONAL INCOME AND PROPORTION OF POPULATION DEPENDENT ON AGRICULTURE

Country	National income per capita (U.S. dollars)	Percentage of total population dependent on agriculture
U.S.A. ..	1,870	14
Canada ..	1,310	16
New Zealand ..	1,000	22*
United Kingdom ..	780	7*
France ..	740	26*
Argentina ..	460	30*
Brazil ..	230	63*
Philippines ..	150	71*
Ceylon ..	110	51*
Thailand ..	80	66
Pakistan ..	70	76*
India ..	60	70

* Proportion of total male workers engaged in agriculture

Source: FAO, State of Food and Agriculture, 1959

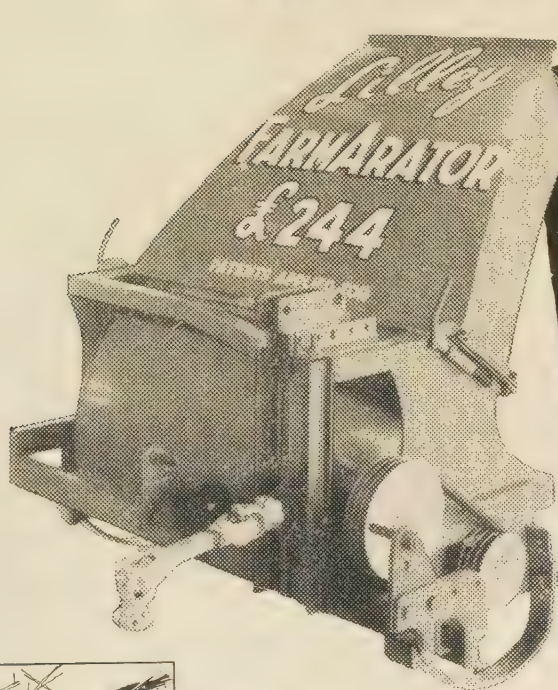
Table 1 shows that the role of agriculture in the national economy tends to be greatest in economically less developed countries with low levels of income.

New Zealand is an exception. New Zealand and Denmark are sometimes quoted as examples of countries which, though purely agricultural, have attained high levels of real income, but about half of Denmark's exports consist of industrial products.

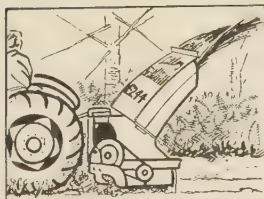
While expenditure on food increases with rising incomes, it does so at a lower rate, so that the share of the income spent on food tends to become progressively smaller in the higher income groups. The percentage of the income spent on food is thus itself some indication of the varying standards of living as between countries; for example, statistics published by FAO show that rural families spent about 32 per cent of their incomes on food in the United Kingdom compared with 66 per cent in India.



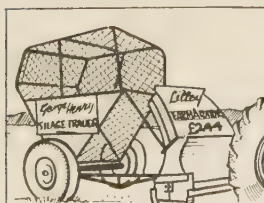
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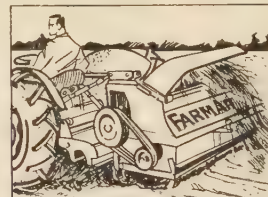
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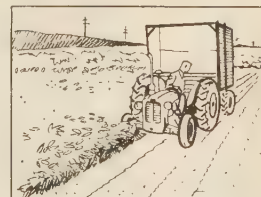
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Where incomes are low the largest expenditure must necessarily be on inexpensive cereals and starchy foods to satisfy hunger, but as incomes rise an increasing share of the money spent on food goes for sugar, fats, livestock products, and fresh fruits and vegetables.

The quantitative aspect or the energy value of food is usually expressed in calories. In many economically less developed countries average calorie intake is only marginally adequate, which means that many millions still go hungry at least part of the time. Further, the calorie value of the diet indicates only its quantitative value; its nutritional quality cannot be expressed in terms of a single nutrient, as proteins, vitamins, and minerals must be taken into account. Moreover, no objective standards can yet be established of the basic requirements of many nutrients. On the present rather subjective basis average diets appear to be defective in most economically less developed countries.

Table 2 compares per capita consumption of various classes of foods in New Zealand and in India.

Table 2 illustrates:

1. The very much lower level of food consumption in India compared with that in New Zealand
2. The heavy dependence in India on cereals
3. The much higher intake of protein, one of the most important nutrients, in New Zealand

▼ A farmer in India using for the first time, under the eye of a United States agricultural expert, a simple steel ploughshare. Improved techniques are making farming easier and increasing yields in under-developed countries.

... FEEDING THE WORLD'S MILLIONS

TABLE 2—PER CAPITA CONSUMPTION OF FOOD IN NEW ZEALAND AND INDIA

Commodity	New Zealand*			India†		
	Calories per day	Protein per day grammes	Fat per day grammes	Calories per day	Protein per day grammes	Fat per day grammes
Cereals	866	25.6	3.0	1,260	29.0	5.2
Roots and tubers	102	2.3	0.1	29	0.4	—
Sugar and syrups	515	—	—	141	0.4	—
Pulses, seeds, and nuts	48	1.7	3.3	236	14.4	3.2
Vegetables	44	2.5	0.3	10	0.6	0.1
Fruits	97	1.2	0.8	19	0.2	0.1
Meat	640	35.7	55.1	6	0.5	0.4
Eggs	54	4.1	3.9	1	0.1	0.1
Fish and shellfish	25	3.5	0.9	3	0.5	0.1
Milk and cheese	529	26.5	29.1	93	4.2	6.2
Oils and fats	471	0.3	53.2	86	—	9.9
Total animal	—	(70.1)	—	—	(5.3)	—
Total vegetable	—	(33.3)	—	—	(45.0)	—
Grand totals	3,391	103.4	149.7	1,884	50.3	25.3

* Average of years 1954-56; † average of years 1954-55 to 1956-57

Source: Food and Agriculture Organization

Foods rich in proteins are also usually good sources of many other essential nutrients, particularly foods of animal origin. This gives added significance to the low intake of animal protein in India.

Poverty and hunger that exist among the greater part of the world's population will be overcome only by building up the agricultural industries and the economies generally of the underdeveloped countries. Much of the aid provided by the more advanced countries is directed toward these ends.

The Colombo Plan

Though the acute problem of the underdeveloped regions is that of inadequate food supplies, this is only a facet of a much broader problem. Such countries could import more

food, particularly types they are not adapted to produce, but to do this they must have overseas exchange.

This in turn requires the development of existing or new export industries. Again, improvements in agricultural production frequently necessitate structural changes, including the elimination of excessively small fragmented holdings. At present there is considerable under-employed labour in agriculture in most of the less developed countries, and industrial development must go hand in hand with improvements in agriculture to provide employment and to develop living standards.

This was recognised at a special meeting of Commonwealth Foreign Ministers in Colombo in January 1950, where it was agreed that progress in South and South-east Asia depended mainly on the development of the



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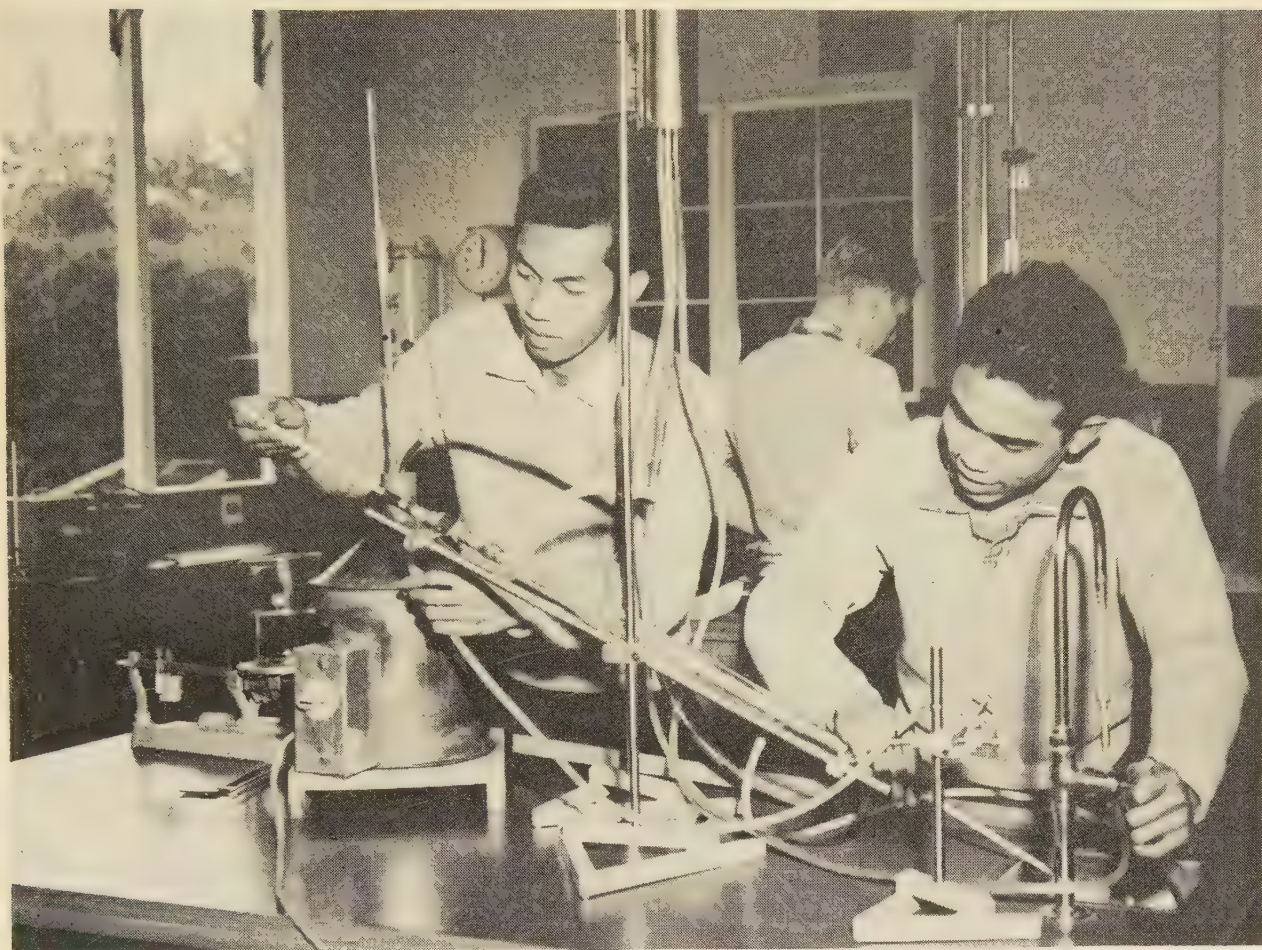
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THE PROBLEM OF FEEDING THE WORLD'S MILLIONS



[National Publicity

Indonesian students training at Massey Agricultural College under New Zealand's Colombo Plan assistance.

area's own rich natural resources and by raising the level of productivity. They therefore formed a committee which met in London in September 1950 and drew up what is now known as the Colombo Plan.

The Plan contained six-year development programmes for the less developed Commonwealth countries in South and South-east Asia (Ceylon, India, Pakistan, Malaya, Singapore, North Borneo, and Sarawak). It identified some of the problems of the area and indicated the ways in which external assistance could help in development. Initial members of the Plan were the Commonwealth countries mentioned plus Australia, Canada, New Zealand, and the United Kingdom. At the outset other countries were invited to join and membership now also includes Burma, Cambodia, Indonesia, Japan, Laos, Nepal, Philippines, Thailand, U.S.A., and Viet-Nam, as well as the countries already listed.

When first drawn up the Plan was for the six years ended June 1957. It has since been extended to 1966.

Most of the countries concerned now have approved plans to promote balanced development and to establish priorities in the light of available resources of material and manpower.

Results have already been significant and in spite of a 10 million increase in population annually, income during the last 10 years has risen at a slightly higher rate than the population growth, and the food situation in most of the countries has improved.

The development of water resources for both irrigation and power production has received high priority in many countries; more land has been brought in; natural resources are being exploited; disease is being fought in man, animals, and crops; and educational and industrial development is taking place.

While the contribution made to overall development by Colombo Plan assistance is small in relation to the tremendous task confronting South and South-east Asia, this help is most important, as it often gives an impetus which is cumulative in its effects. The forms of assistance include:

Grants and loans for national development

Commodities including food grains, fertilisers, and consumer goods

Specialised equipment

Services of experts and technicians

Training in advanced technology

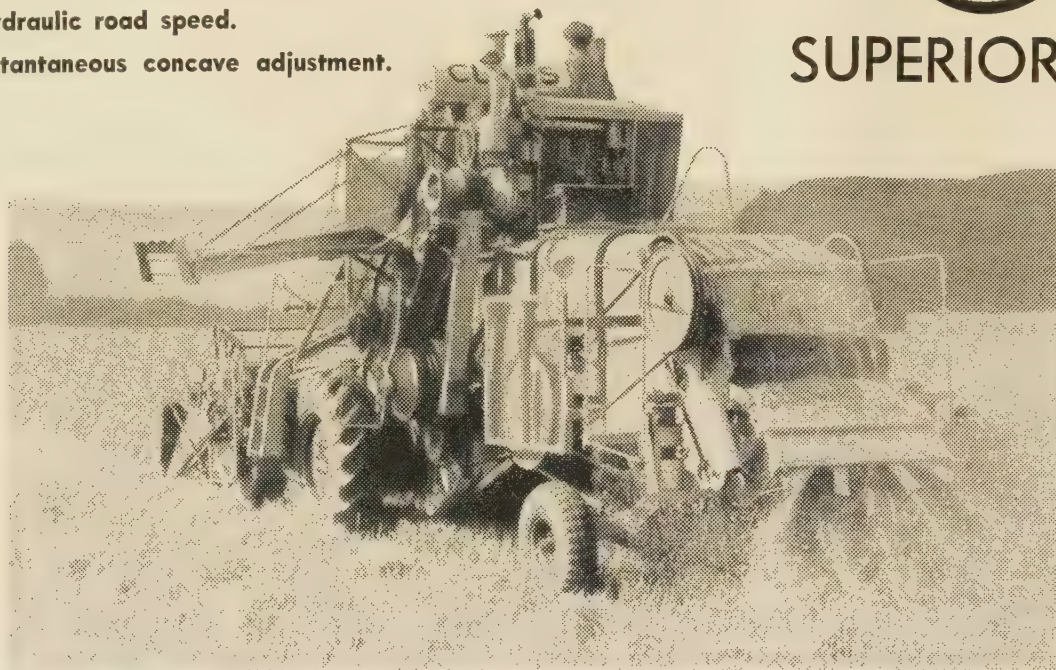
U.S.A., the major contributor of funds, has provided assistance valued at about £2,022 million. Other contributors have been the United Kingdom, Australia, Canada, Japan, and New Zealand. In addition, some of the recipients of aid have provided help to one another.

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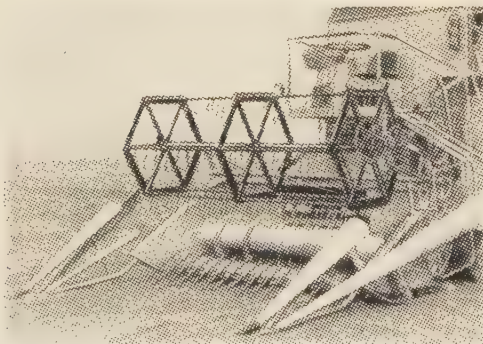
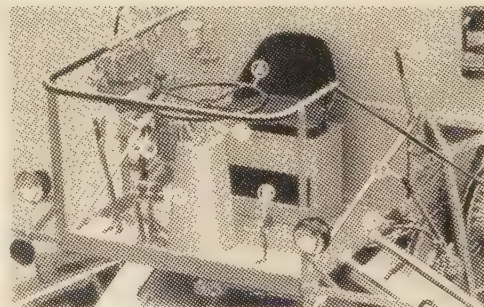


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New Zealand's commitments for capital aid and technical assistance to the area to 31 March 1960 were about £9.3 million.

Capital aid has been mainly the direct transfer of overseas funds. Projects assisted by New Zealand include:

The construction of the Pazundaung River bridge in Burma

A dry-farming research station in Ceylon

The reconstruction of Akkarayankulam irrigation tank in Ceylon

The All-India Institute of Medical Sciences

The Indian dairy industry

Equipment and road and water transport for mobile veterinary dispensaries in Laos

The agricultural college at the University of Malaya

The dairy industry in Nepal

A sugar mill in East Pakistan

Equipment for the Veterinary Laboratory at the National Institute of Bacteriology in Viet-Nam

New Zealand has spent over £1.4 million on technical assistance. A total of 721 people from the countries of South and South-east Asia have received training in New Zealand, and 121 New Zealand experts have served in the area.

At 31 March 1960, 227 students were training in New Zealand and more were expected during the year. At the same date 32 New Zealanders were carrying out technical assignments in Asia.

The Colombo Plan is multilateral in that it takes cognizance of the problems of South and South-east Asia as a whole and tries to coordinate them and at the same time bilateral in that negotiations for assistance are made directly between donor and receiving country. This procedure is flexible and smooth in operation.

Results over the past decade indicate that the basic aim of the Colombo Plan has been achieved; the free nations of South and South-east Asia are now beginning to move forward, though the tasks ahead remain as formidable as ever.

Freedom from Hunger Campaign

FAO is one of a number of inter-governmental agencies which are linked with the United Nations Organization through special agreements. The motto of FAO is "*Fiat Panis*" ("Let there be bread") and its objective is to contribute to an expanding world economy:

By raising levels of nutrition and standards of living throughout the world

By securing improvements in the efficiency of the production and distribution of food and agricultural products from farms, forests, and fisheries

By bettering the conditions of country dwellers

There are 76 member countries of FAO, which has its headquarters in Rome and which functions in three ways:

First, it collects, analyses, interprets, and disseminates information relating to nutrition, food, and agriculture.

Secondly, it promotes national and international action with respect to research, education, administration, and the spread of public knowledge relating to nutrition, food, and agriculture. It also promotes the conservation of natural resources and the adoption of improved methods of agricultural production and the processing, marketing, and distribution of food and agricultural products.

Thirdly, it furnishes technical assistance.

The last biennial conference of FAO held in November 1959 approved a proposal to conduct an international Freedom-from-Hunger Campaign to focus world-wide attention on the problem of hunger and to mobilise national and international efforts toward its solution.

FAO is responsible for planning and coordinating the campaign, and the cooperation and assistance of other United Nations agencies has been sought. The support of non-governmental organisations has also been sought, and representatives from 75 such bodies attended a special meeting held in Rome last May. These organisations will assist in bringing the campaign to the man in the street and will have an important role in raising funds. The campaign was launched on 1 July 1960 and will continue until 1965.

The campaign will intensify the work of FAO in improving the agricultural economies and food supplies of the underdeveloped countries. The aim is alleviation of causes of hunger rather than adoption of stop-gap measures. The four broad categories of activities are:

1. Informational and educational
2. Research
3. National action programmes
4. FAO guidance when requested for technical assistance and programmes.

. . . FEEDING THE WORLD'S MILLIONS

National action will be the heart of the campaign. Most of the projects will relate to such aims as increasing food production, improvements in nutritive quality, prevention of food losses, and increased effectiveness in distribution. Activities in the other three categories should ensure that the urgency of the problem is recognised and that the action programmes are carried out in the best possible way.

A special fund is being established by FAO to further the campaign, and member countries, organisations, foundations, and individuals are being asked to contribute. Countries have been requested to establish national campaign committees to ensure active participation and to raise funds.

Participation by New Zealand

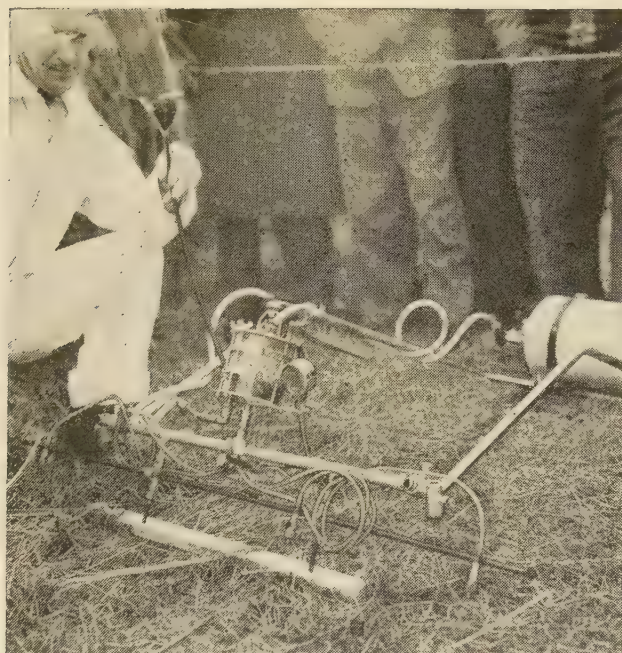
Hunger and malnutrition are real and urgent problems in many countries and the post-war upsurge in the growth of population has intensified them. The Freedom-from-Hunger Campaign therefore merits our full support, as it recognises that adequate food for the world's population can be provided only by building up the agriculture of the less developed countries.

New Zealand is a staunch supporter of FAO and has contributed significantly to the prestige of the organisation. Because our agriculture is one of the most advanced and efficient in the world, by providing practical training and sharing our knowledge with others we can make a most effective contribution to the Freedom-from-Hunger Campaign.

Our assistance in the past and our ready response to requests for help suggest that New Zealand will play its full part in the drive to attain that difficult but not unattainable goal, adequate food for each and every person on the face of the earth.

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ROUND THE RESEARCH STATIONS

Current Work and Findings in
Department of Agriculture and
Department of Scientific and
Industrial Research Trials
and Experiments

Rukuhia

Weed Control Experiments

Widespread use has been made of a number of chemical weedkillers discovered within recent years, and the large overseas chemical firms have continued intensive research to find new weedkillers to deal with some of the remaining weed problems. Many new materials have either recently become available overseas or are still in the experimental stages.

One of the duties of the weed research sections of the Department of Agriculture is to find out whether these new materials are likely to be of any use in New Zealand. When the chemicals are used for selective weed control in pastures or crops not only do the minimum rates necessary to control the weeds have to be determined but the maximum rates tolerated by the pasture or crop plants. In view of the wide range of chemicals, weeds, pastures, and crops, and the various factors such as rates and times of application, weather, and soil types, all of which affect the results obtained with the weedkiller, an extensive research programme would be necessary to study even the combinations considered most likely to be of practical interest. The selection of the work undertaken and the methods of carrying it out have to be carefully considered so that the limited resources may be used to the best advantage. Techniques which facilitate the research work are therefore important.

An important advance has been the development at Rukuhia last year of a portable sprayer which dilutes continuously, at a constant rate, the solution being applied. This enables a strip to be sprayed so

that the rate of chemical applied is halved each time a unit distance is covered. Thus the sprayed strip will have a high rate of application at one end and a low rate at the other. Since the rate applied changes on a logarithmic scale with the distance covered, the apparatus is called a logarithmic sprayer.

The first logarithmic sprayer, developed in England several years ago, and the various subsequent modifications all require a motor to drive the pump and mixing mechanism and they were not convenient for small plot trials. The Rukuhia unit uses compressed air, an original idea for mixing, and is light and portable. This logarithmic sprayer enables information regarding the tolerances of weeds and desirable plants to weedkillers to be obtained more readily. After the preliminary screening of new chemicals with the logarithmic sprayer the most promising materials have to be tried out at the appropriate rates in more detailed trials for at least two years before firm recommendations can be made with confidence.

This process of testing new materials by the Department of Agriculture is going on continuously. The public does not hear of the many experiments which show that the chemicals cause too much damage to the desirable plants to be of any practical use. On the other hand each year there is something new which has passed the tests conducted during the preceding few years. For example, two years ago MCPB and 2,4-DB were recommended for the control of weeds in new pastures and already this is becoming a common farm practice. Last year MCA was recommended for the control of willow weed (*Polygonum persicaria*) and redroot (*Amaranthus retroflexus*) in brassica crops.

Entomology Division

Biological Control of Insect and Weed Pests

Insecticides are essential to modern horticulture and agriculture, but must be used intelligently in association with biological methods of control. The day of biological versus chemical antagonism is gone and has been replaced by an era of cooperation.

Where crops are virtually flooded with insecticides, surrounding areas harbour pests which migrate back to the cropping areas once insecticide effectiveness is gone. In these reservoir areas parasites, predators, and diseases can do their work on the pests, ultimately decreasing the need for frequent use of insecticides. The same principle applies to the control of noxious weeds by the use of weedicides and plant-destroying organisms.

In view of the enormous field open for exploitation, the excellent prospects for success in New Zealand, and the greatly increased international facilities for search and collection of beneficial insects, diseases, and other organisms, biological control is being advanced as rapidly as possible by the Entomology Division in Nelson.

So far during 1960 a number of parasites have been introduced to attack San Jose scale and some of these have been liberated.

In addition, parasites of vegetable weevil are expected within the next few weeks and two insects are being imported to assist in the control of St. John's wort.

Targets for future control include not only a number of insect pests but also several noxious weeds. Some of these, such as sweet brier, will involve long-term and very careful investigation.

Wallaceville

Redwater in Cattle and Sheep

Redwater of ruminants caused by the grazing of brassica crops must not be confused with the redwater caused by *Leptospira* species. Redwater is essentially a disease in which the red cells of the blood break down and liberate their red pigment into the urine. For some years attempts have been made to find out what factor in brassicas causes the disease, but so far the problem is unsolved. Attempts that have been made, using excesses of fertiliser on chou moellier, to produce the disease experimentally at will have also been unsuccessful. It has been noted that a farmer can grow chou moellier and feed it off without trouble for years and then suddenly be faced with an acute attack, particularly in cattle. There is no known cure for the disease, but stock should be taken off brassica crops at the first sign of redwater.

Invermay

Weed Control in Wheat

The widespread use of hormone weedkillers, mainly 2,4-D and MCPA, on cereal crops appears now to be creating a problem in some areas through the multiplication of weeds resistant or partially resistant to the commonly used herbicides. Where weeds such as wireweed, cornbind, or cleavers are abundant cereal growing becomes difficult.

At Invermay the effects on a mixed weed population of some new chemicals developed in the United Kingdom for the control of hormone-resistant weeds are being studied. It is important to study at the same time the effects on grain yields and on the baking quality of the wheat.

Results for the past two seasons have shown that "Mecoprop" at 1 lb per acre of the commercial mixture gives good weed control and highly significant grain increases.

Last season a proprietary mixture of MCPA and 2,3,6-TBA also gave highly significant grain increases.

All plot samples, of course, have to be dressed free of weed seeds. When this is done increases have been recorded in the clean grain yield of up to 27 per cent.

Wallaceville

Contagious Ecthyma (Scabby Mouth) in Thar

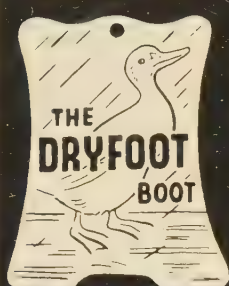
Deer cullers working in the Havelock River area, Upper Rangitata, report that there are very numerous there and that many of the young animals are affected with scabby lesions about the head and feet. Some of the more severely affected animals have died.



The foot lesion consists of erosion of the skin between the digits, while head lesions take the form of lumpy scabs round the lips and muzzle which when removed leave a raw granulating area. Small cauliflower-like proliferative lesions also appear on the gums and hard palate.

The condition closely resembles severe contagious ecthyma in sheep, and transmission tests at Wallaceville have proved it to be contagious ecthyma.

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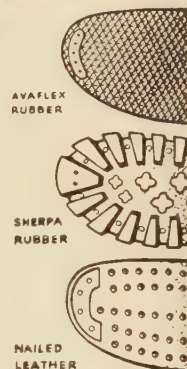


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The Home Orchard in Summer

By S. FREW,
Instructor in Horticulture,
Department of Agriculture,
Christchurch



THE greatest attraction in growing fruit in the home orchard is perhaps the prospect of having tree-ripened stone fruit. Cherries, apricots, peaches, nectarines, and plums can be picked at home fully ripe, soft, and juicy. This article discusses the harvesting of stone fruit and gives some advice on other summer activities in the home orchard, including the budding of stone fruit trees.

EXCEPT for cherries, which are usually a firm fruit when ripe, stone fruit is at its best when it has been allowed to reach the "soft-ripe" stage before picking.

Quality improves considerably in the last few days as the fruit approaches full maturity. Size and weight increase rapidly and the completion of conversion of starch to sugar develops the fruit's full flavour.

The commercial grower, who must harvest his crop reasonably firm so that it will withstand handling, is

generally unable to take full advantage of this improvement in quality which occurs at full maturity. The home orchardist, on the other hand, can afford to wait the extra few days before picking and thus obtain the full benefit from being able to produce fruit that is fully tree ripened.

Make Selective Pickings

Fruit trees do not ripen their crop evenly over the whole tree. Generally fruit on the extremities of trees and the uppermost branches ripens first, while that in shaded and lower parts of the tree is later. Individual fruits should therefore be harvested as they mature, and with most classes of stone fruit this means several pickings spread over two or three weeks.

Slight pressure with the fingers will indicate whether the fruit is soft and ready to pick, and fully tree-ripened fruit can be removed at a touch. Bright typical colour for the variety will have developed at this stage, varying from a high blush in coloured varieties to a golden yellow in many green-yellow varieties. There are exceptions to this, of course; greengage plums, for example, always remain green, but the soft texture of the flesh when ripe is a sure guide.

Handle with Care

Every care should be taken in handling this fully ripened fruit. Picked carefully by hand, it should be placed, not dropped, into the picking container, which should be shallow and of restricted dimensions. This will prevent any bruising of bottom fruits through the excessive weight of fruit on top. Fruit picked at full maturity is highly perishable and should be used immediately.

Even cherries, which differ from other stone fruit in that they are firmer and more solid when ripe, can be held only a few days without deterioration. To help prolong their storage life they should be picked with stems intact.

Partially Ripe Fruit

If you want to hold stone fruit for a few days before using, pick it earlier, when it is slightly less mature; some of the quality is sacrificed, of course. Fruit gathered at this stage is more comparable to fruit harvested by commercial growers for dispatch to market, when it may be said to be in a condition termed firm ripe.

Fruit harvested at the firm-ripe stage must receive nearly as much care in handling as tree-ripened fruit.



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Though not so soft or so easily bruised, it remains a highly perishable product requiring every precaution against rough treatment.

The storage life of this fruit is very limited. While not as perishable as fully ripe fruit, it still has a fairly short life after picking and can be kept only for a few days even if stored in a cool place or in the home refrigerator. Fruit in this condition is at the best stage for bottling or preserving.

Jam Fruit

Fruit intended for jam or culinary purposes can be picked at an earlier stage still. In fact stewed fruits and jams often appear to be better when made with slightly immature fruit. Immature European plums are often used for this purpose. If possible, plums should be picked with stems intact to prevent stem-end rots developing. Any immature fruit picked for culinary purposes cannot be expected to develop into good dessert quality.

Summer Spraying

Spraying as outlined in previous notes should be maintained during summer, especially with later maturing fruits. Care should be taken, however, not to spray fruit approaching maturity with poisonous materials; there should be an interval of three to four weeks between the last sprays and harvesting.

Thinning

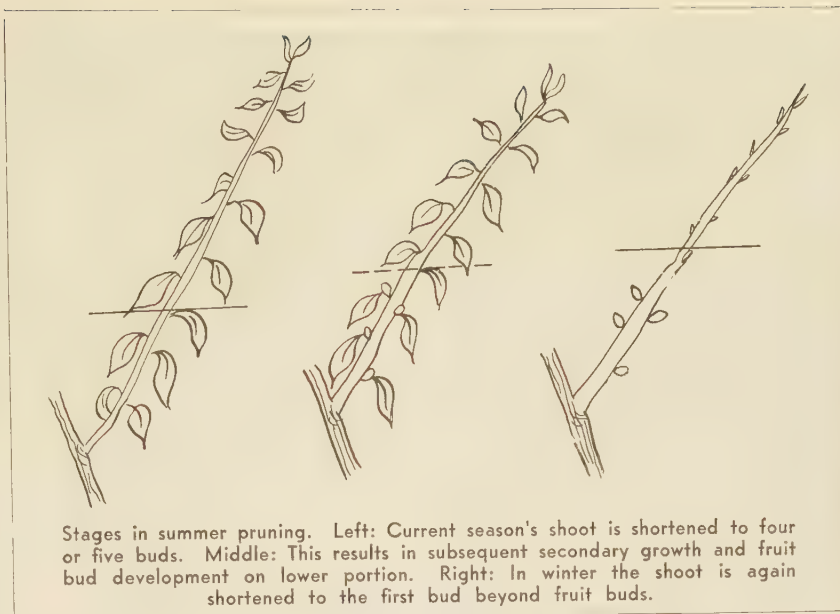
If not already completed, thinning of stone fruit should be attended to without further delay. Except on light cropping trees most clusters should be thinned to singles to get size and quality.

Pip fruits may be thinned in early December, except early varieties such as Irish Peach and Gravenstein, which should be thinned earlier.

The removal of surplus fruits not only aids the size, colour, and quality of the remainder, but results in many additional direct and indirect advantages. Control of disease is easier when fruit does not remain in clusters and when diseased specimens have been removed.

Thinning relieves overcrowded limbs which might break under the weight of the crop. Because trees producing a heavy crop may be unable at the same time to develop good fruit buds for the following year, unthinned trees or those insufficiently thinned tend to produce alternately heavy and light crops.

A well balanced tree should produce young wood as well as fruit. A heavy crop may restrict this young growth, and thinning is a means of restoring a proper balance between fruit and wood growth. Only in "off" years when a tree is carrying practically no crop can thinning really be dispensed with.



How to Thin

Thinning should not be attempted by hand, as this often results in loosening fruits desired to be retained or in injury to next year's fruit buds and spurs. Special thinning shears should be used for the work. A small type of secateurs made for the purpose or snub-nosed scissors which will not puncture fruitlets are the most suitable of tools.

What to Thin

Deformed or diseased specimens should be removed first. The tree should then be relieved according to the extent of its crop. If the "set" has been heavy, fruitlets will often be found in clusters of five. These clusters should be reduced to two fruits.

In removing surplus fruits take the "king" or centre fruit first. This fruit is frequently abnormal in shape, short stemmed, and is likely to push off other fruits if left intact.

Even when reduced to clusters of two, the crop may still be too heavy and further reduction may be necessary, particularly on weaker growing and less sturdy laterals. Fruits on the tips of lateral growths or adjacent to the main leader growing points should be removed entirely to prevent any interference with necessary and vital growth extensions.

As a guide to thinning operations, the following points should be remembered:

1. The stronger and healthier is the fruiting wood the greater the quantity of fruit that can be left on it.
2. Weak trees usually carry heavy crops of small fruit and require drastic thinning to produce fruit of good size and quality.

3. Weak and thin laterals usually produce only small fruits which even when thinned do not always develop into a good size.

4. Fruit abnormal in shape at thinning time usually retains this deformity through to maturity.

5. Insect damage and other blemishes may increase in size as the fruit grows.

6. Though thinning assists tree growth and bud development, it does not take the place of good manurial and cultural practices.

Summer Pruning

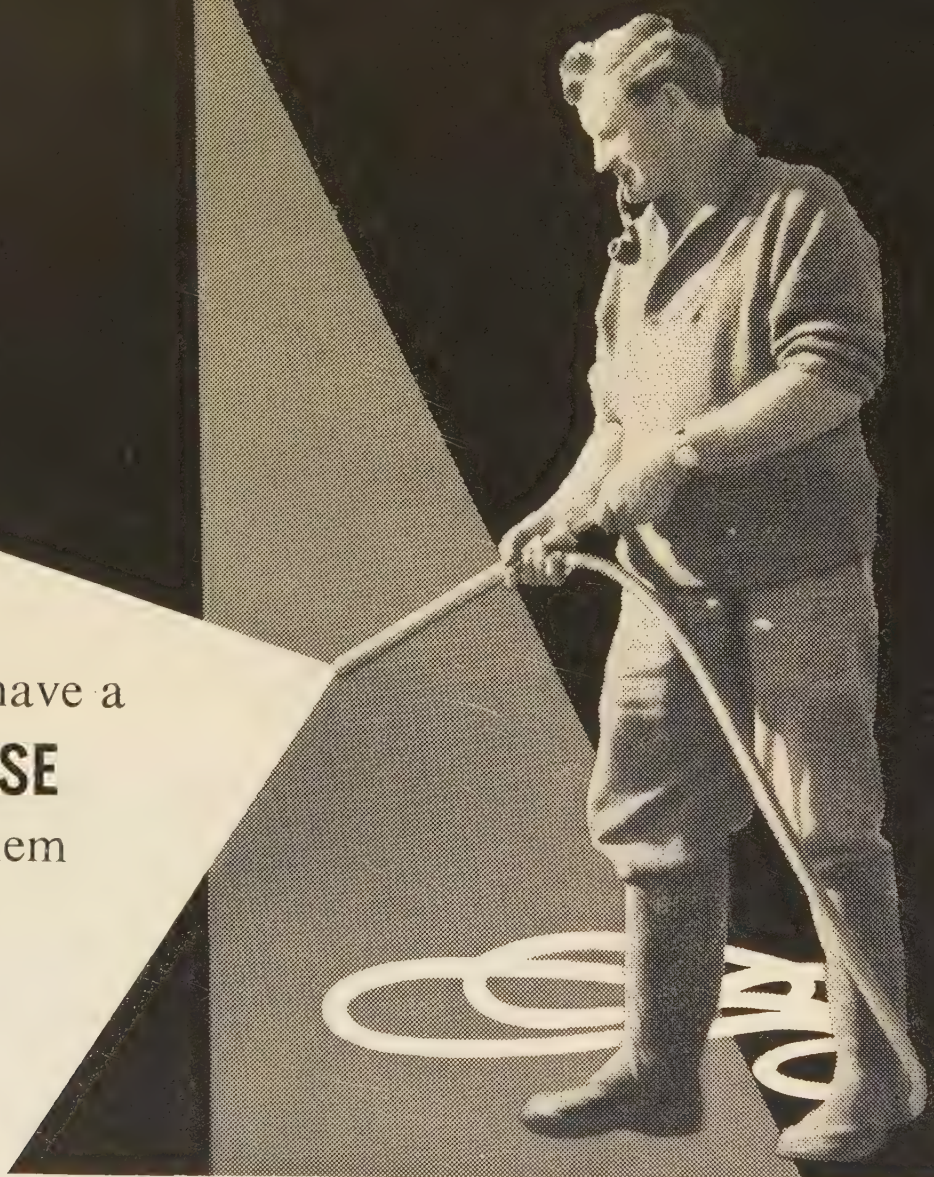
Though summer pruning has rather fallen into disuse in recent years, there is a place for it in the home orchard, particularly for dwarf apple trees.

The object of summer pruning is to induce the tree to develop more fruiting wood and to restrict and remove excessive growth. By shortening the current season's wood growth the temporary check given frequently encourages the development of fruit buds on the remaining new wood. Furthermore, this reduction of foliage and young growth similarly restricts the tree's root development, and dwarf trees and even standard sized trees can be contained to a manageable size by this means. Summer pruning need be practised only on a vigorous growing tree.

The principle of summer pruning is to shorten current season's growths during midsummer to a length suitable for the development of short fruiting laterals. Young wood from 12 in. to 18 in. long is best for this purpose and may be shortened to four or five leaves, from which fruit buds should subsequently develop.

The secondary autumn growth produced should be shortened during the

if you have a
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following winter pruning, and the short lateral remaining will be capable of producing fruit in the next season.

Budding

The technique of budding is generally associated with the raising of young trees and is not often practised in the home orchard. However, where it is desired to rework stone fruit trees, budding is more satisfactory than grafting.

Support for Trees

In spite of good thinning trees carrying a heavy crop often become weighed down to the extent that limb breakages may occur or branches will not regain their former upright position after the crop has been removed.

To prevent these damaging effects some support should be given to heavily weighted limbs. This can be done by the use of props, an effective but cumbersome means, or by the better method of adopting the "may-pole" system, which, as its name implies, comprises a pole up the centre of the tree with wire supports from each limb attached to the top of the pole. Wire of 10 or 12 gauge is suitable, but care should be taken to insert a protective shield between the wire and the branch; otherwise it may cut into the wood. A small piece of tin or a section of rubber makes an effective shield.

Mulching

During the summer fruit trees will benefit from a mulch. This will keep the soil cool and moist, suppress weed growth, and eventually break down into valuable humus.

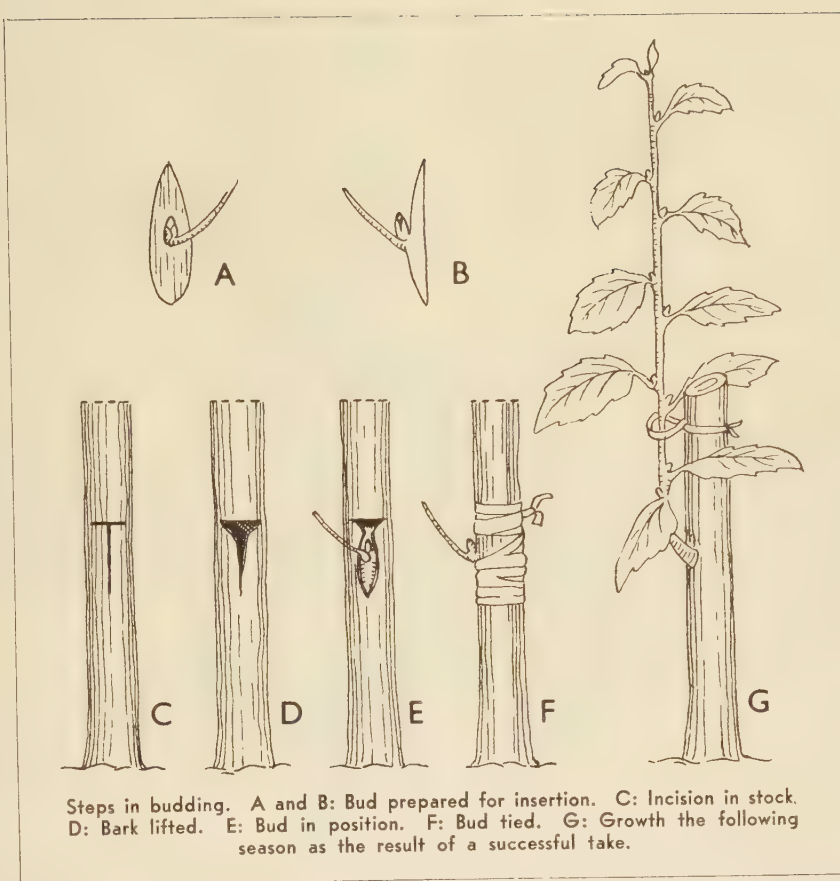
A mulch can be composed of various materials; grass clippings are satisfactory and straw is excellent. Baled straw is usually readily available. To cover all the ground between trees it may be spread at the rate of one bale to 20 sq. yd. This will make a good, thick cover which will rapidly consolidate and later provide good humus.

If grass clippings are used, do not allow the mulch to come in contact with the trunk of the tree; otherwise rotting of the bark may result.

Multiple Variety Tree

The multiple variety fruit tree is a novelty which has some application to the restricted space problem confronting the owner of the small section. Growing several varieties on the one tree will give an extended harvesting season and a more varied assortment without increasing the number of trees.

It has a further advantage in assisting to overcome any pollination problems. Many plums, for example, are self-unfruitful and require specified complementary varieties to secure good blossom fertilisation. The budding on of a second variety provides cross pollination.



Steps in budding. A and B: Bud prepared for insertion. C: Incision in stock. D: Bark lifted. E: Bud in position. F: Bud tied. G: Growth the following season as the result of a successful take.

The novelty of growing several kinds of stone fruit on the one tree is also possible within certain limitations. Apricots, Japanese plums, and nectarines will all grow successfully on peach stocks, and a combination of these fruits with peaches on the one tree is therefore quite feasible.

With pip fruit a multiple variety tree can be developed by grafting, but with stone fruit budding is the common method.

Budding Operation

Budding consists of selecting a bud from a current season's growth of the required variety and inserting this into a current season's growth on an existing tree.

Stone fruits are budded during January and February, while the bark of the young wood will still lift readily without tearing and when the young buds to be inserted in this wood have fully developed.

It is preferable to place the buds on the outside of the tree so that subsequent growth will not crowd the centre of the tree.

A vertical incision about 1½ in. long is then made in the stock at the required height, penetrating the bark but not cutting into the wood. The incision is then crossed at the top by a horizontal cut, the two incisions

forming a T. As the second cut is completed the knife is given a slight upward twist to raise the edges of the bark at the junction of the two incisions. The stock is then ready to receive the bud.

To prepare the bud the leaves on the bud stick should be removed by cutting through the leaf stalk or petiole, leaving about ½ in. of this attached to the bud. The bud is then removed by inserting the knife in the wood ½ in. below the bud, and, with the blade almost flat, drawing it under the bud to emerge ½ in. above it.

The bud, held by the petiole, is then inserted under the bark at the horizontal cut and forced gently down until the top of the bud is just below the horizontal cut. The operation is completed by tying the join firmly with raffia or adhesive plastic tape, and when finished the whole incision should be covered, with the exception of the bud itself.

A successful take is indicated if the bud is fresh at the end of three weeks. At four weeks all ties should be loosened. The bud will remain dormant until the following spring.

At first signs of growth in spring the wood beyond the bud should be cut off and any shoots other than that from the bud itself should be rubbed off as they appear.

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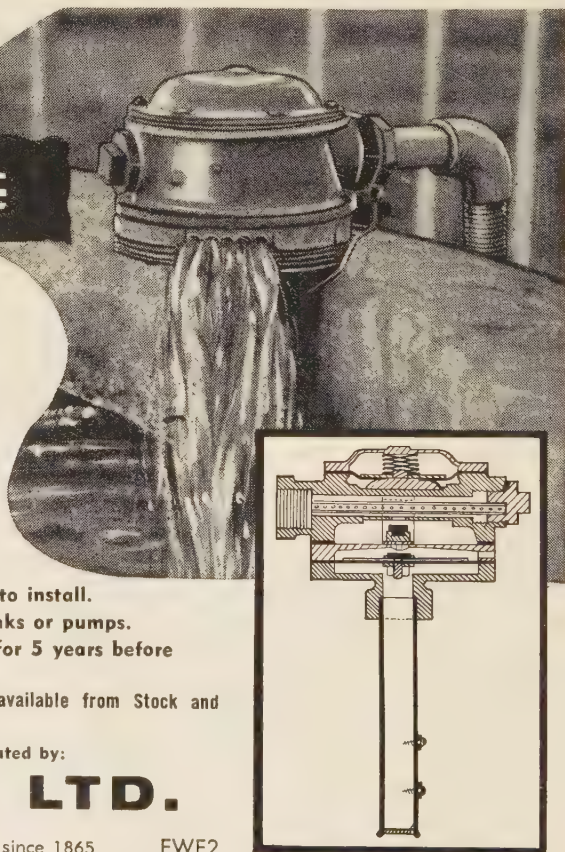
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The Business Side Of Farming

Use of Water from Natural Watercourses

By R. H. SCOTT,

Land Utilisation Officer, Department of Agriculture, Wellington

WITH the increasing use of spray irrigation equipment by farmers, particularly in areas of low effective summer rainfall, some people are becoming concerned at the draw-off of water from natural watercourses by these plants and at the problems which can therefore be created for farmers. This short article, one of a series dealing with problems faced by farmers as businessmen, sets out some of the salient matters concerning the use of water from natural watercourses.

WHILE the bed of a natural watercourse may be owned by a farmer through whose property it flows, the water in it is not his private property, though he has certain limited rights to the use of it. Water flowing in a natural watercourse is really regarded as public and common, and those who have the right of access to it may reasonably use it. The bed of a navigable river belongs to the Crown, but ownership of the bed of other natural watercourses that form boundaries of properties is shared equally between the owners on each side of the watercourse. Each owner is regarded as the owner of the bed of the watercourse from his bank to the middle line of the watercourse. The middle line is taken as the middle distance between the two banks of the stream, which thus may not coincide with the middle distance of the width covered by the flowing water.

The owners of land on the banks of a natural watercourse are known as riparian owners and as such possess riparian rights.

The rights of a riparian owner to use water from a natural watercourse can be looked at under several headings.

Water for ordinary use. A riparian owner can draw water from such a

stream for ordinary purposes associated with his occupation of the land. For instance, he can draw off water for domestic purposes such as for drinking, washing, and cooking and he also has the right to use water for his animals. For these ordinary purposes he can use as much water as is consistent with normal usage, even though other riparian owners lower down the stream are inconvenienced by a diminution of the flow of the stream or even by exhaustion of the water.

Water for extraordinary use. A riparian owner can use water for other than ordinary purposes provided he does not interfere with the rights of other riparian owners. Water for irrigation is an extraordinary use, and a riparian owner can take water for this purpose provided other riparian owners do not suffer any material injury by the diminution of the flow in the stream.

Diversion of water. All of the water or part of the water from a natural course may be diverted by a riparian owner provided he returns the water into the watercourse in substantially the same quantity and quality as it was when it was diverted by him.

Protection of land from flood waters. Provided a riparian owner can do so

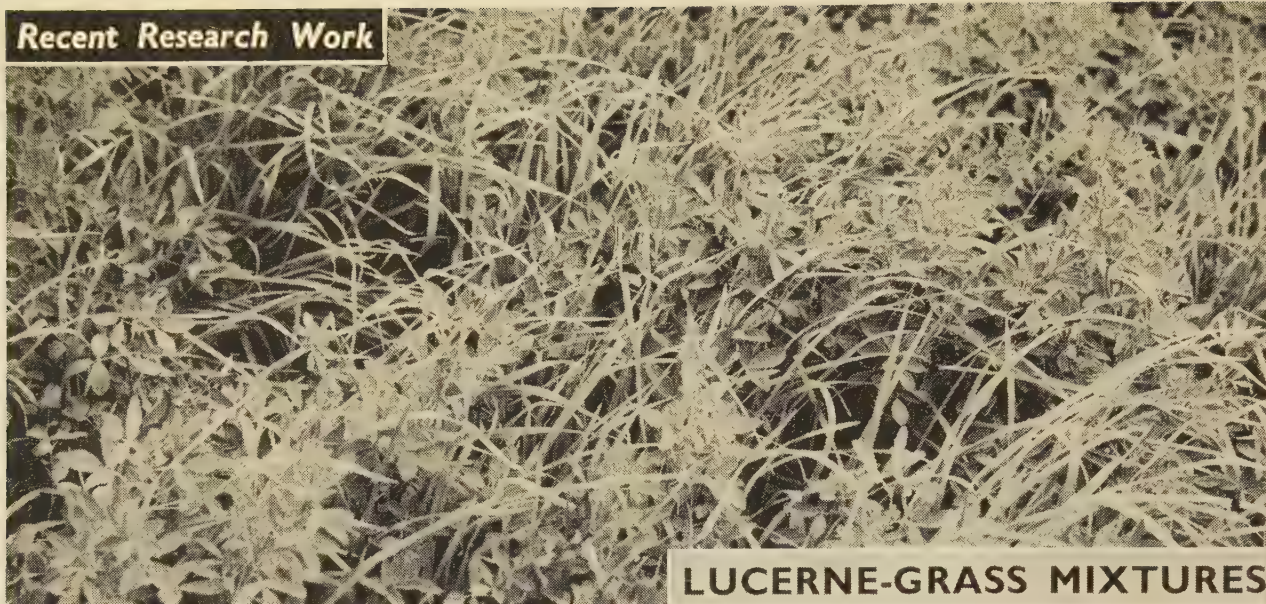
without injuring others, he can protect his land from ordinary floods by building protective works, but not if the works result in diverting flood waters from a flood channel on to the land of other riparian owners.

If an extraordinary flood is known to be coming, any riparian owner can protect his land, even though this results in injury to the property of neighbours. Extraordinary floods are looked on as happenings against which every person has the right to protect himself.

Obstruction of watercourse. No riparian owner has the right to obstruct the flow of water and thus throw it back on to the land of riparian owners on the stream above him or on to land of adjacent riparian owners. However, he is not responsible for the consequences of any obstruction in the watercourse where this results from natural causes such as the silting of the bed of the course.

Beside having certain rights a farmer who is a riparian owner has obligations. There are a number of matters which can affect riparian owners, and where any such owner proposes to take an action which in any way may affect others he should make sure of his obligations by consulting his legal adviser.

There is a growing awareness, particularly in certain areas in New Zealand, that water is becoming a scarce resource. The time is possibly approaching when consideration will have to be given to implementing legislation to ensure that the use of surface water is subject to some control so that some may not benefit to the detriment of others. This can be particularly important to many farmers, as adequate water is essential to plant growth and for animals.



LUCERNE-GRASS MIXTURES

▲ The mixture of lucerne and cocksfoot is well balanced in this stand at Broadfield, Canterbury.

LUCERNE-GRASS mixtures in New Zealand are grown primarily for grazing and are confined largely to the drier areas of Canterbury, Marlborough, and Otago, where the rainfall is generally less than 30 in. and summers are dry. Cocksfoot is favoured as the grass because it can produce throughout the year under a wide range of climatic conditions and is relatively non-aggressive compared with ryegrass. *Phalaris tuberosa*, timothy, or other grasses are sometimes used.

IN the higher-rainfall areas of Otago and Southland lucerne is grown primarily as a hay crop and is either ungrazed or grazed leniently during winter. In similar conditions in England lucerne-grass mixtures have shown advantages over lucerne alone. For instance:

1. Production is increased, particularly in the first year.
2. Lucerne-grass mixtures can provide valuable grazing in winter and early spring.
3. Weeds and weed grasses are kept in check.

To see whether greater use could be made of lucerne-grass mixtures in New Zealand, trials were started in 1954 at the Department of Agriculture's Invermay Research Station with mixtures of lucerne and various grasses. These included cocksfoot, timothy, perennial and short-rotation ryegrass, *Phalaris tuberosa*, meadow fescue, tall fescue, and prairie grass.

RESULTS In six years' investigations at the station the lucerne-cocksfoot mixtures appeared most suited to the conditions, though all the grasses showed promise at times. Cocksfoot was superior in droughts and except in the first winter after sowing compared very favourably with other grasses for winter production. Disadvantages were its slow establishment, its lower palatability than some of the other grasses under trial, and its tendency to become dominant. This was especially noticeable in one trial where a high rate of cocksfoot (4 lb) was sown with 12 lb of lucerne and where the management was unfavourable. In trials where cocksfoot was sown at a lighter rate (2 to 3 lb) in alternate rows, it did not tend to dominate the lucerne, and this method was generally superior for this reason.

Timothy was useful during spring, when it gave a large bulk of palatable herbage. Disadvantages were its inability to compete with weeds, its poor recovery after mowing under dry conditions, and its poor winter production.

Meadow fescue grew well during spring and was less competitive than cocksfoot and more palatable. However, its performance during droughts and in winter was poor.

Tall fescue showed promise, as it was one of the most compatible species and production was high throughout the year, but it lacked palatability.

The ryegrasses proved too aggressive for the lucerne even when sown in alternate rows. Winter production was good, but summer growth only fair.

Phalaris tuberosa's summer and winter production compared unfavourably with cocksfoot and it was less able to compete with weeds. Prairie grass was promising, especially during the first winter, but will not stand close grazing and may disappear within two or three years. Combination of several grass species failed to show any advantage over the lucerne-cocksfoot mixtures.

In the trials the mixtures were grazed in late winter and early spring, but not in summer and autumn. Two or three hay cuts were taken, depending on the season. Under this system of management lucerne tended to become dominant after two to three years, lucerne comprising about 60 per cent of the mixture and cocksfoot 40 per cent. When sown in alternate rows cocksfoot proved more compatible with lucerne and results generally were better than with mixed sowings.

CONCLUSION The trials show that greater use could be made of mixtures in this area. A mixture of lucerne and cocksfoot sown in alternate rows proved most satisfactory, being productive at all times of the year, and providing valuable feed during shortages.

—N. A. CULLEN,
Senior Scientific Officer, Department of Agriculture's Invermay Research Station

A SHADE HOUSE

SHADE houses (also known as lath or bush houses) are becoming very popular in New Zealand home gardens, and commercial nurseries are finding them one of their most important items of equipment. By providing coolness, a moist atmosphere, shade, and protection from wind and frost they enable a range of plants to be grown which would not otherwise flourish in the prevailing climate. In warmer districts they are often of far greater use than a glasshouse and generally require far less attention.

By J. S. SAY, Horticulturist,
and JOY WATKINS,
Horticultural Advisory Officer,
both of
Department of Agriculture,
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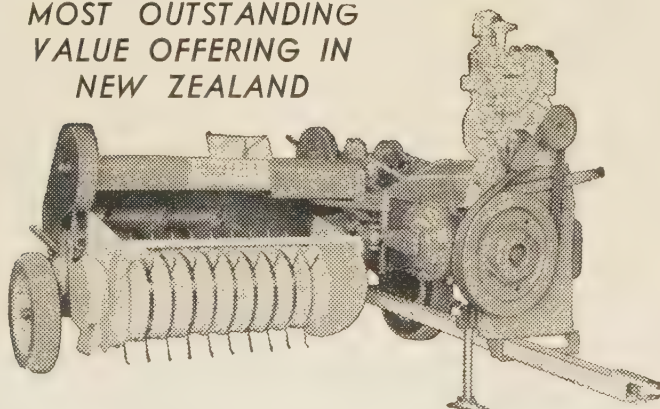
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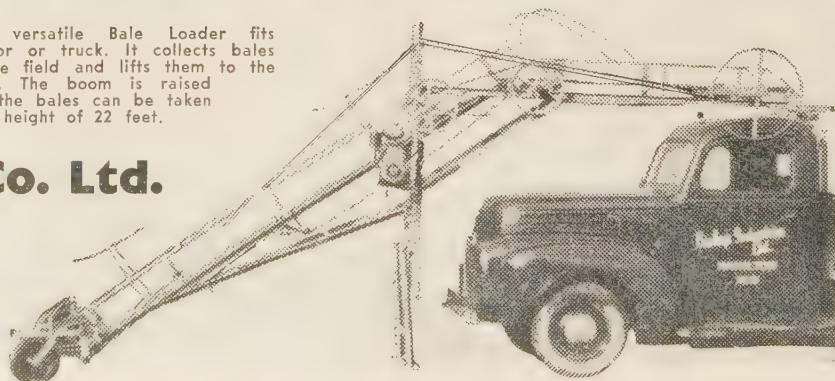
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Uses in the Home Garden

In warm districts, those with hot and/or dry seasons or hot winds, they provide ideal conditions for cool climate plants such as cyclamen, fuchsias, and camellias and for ferns which require cool, shady, moist conditions.

A very wide range of pot plants such as tuberous and other begonias, primulas, schizanthus, and many foliage plants usually grouped under the general heading of house plants do exceedingly well in the semi-shaded, moist, protected atmosphere provided by a shade house. Some may need further protection during winter, but if this cannot be provided by a glasshouse, a polythene lining will serve the purpose.

A number of orchids, particularly cymbidiums, grow and flower far better in a shade house than in a glasshouse in the warmer districts. They may be grown in pots or in beds.

Bromeliads and epiphytic cacti, such as epiphyllums and zygocactus, are very much at home in shade houses, which also provide perfect conditions for raising many seedlings such as lilies, rhododendrons, azaleas, and camellias and for propagating these plants vegetatively.

An open space in a shade house paved with concrete slabs and furnished with garden chairs and a table makes a very attractive and pleasant outdoor living room for summer use.

Commercial Uses

Shade houses have a use in practically all types of commercial nurseries. In tree and shrub nurseries they can be used for propagating a wide variety of plants by many methods—seeds, cuttings, budding, and grafting.

They are particularly valuable for the propagation of rhododendrons and camellias. They provide suitable conditions for hardening off seedlings and cuttings after they have been removed from propagating houses.

Newly imported plants, which often arrive out of season, can be protected until they are acclimatised. Tender plants lifted from the open ground in late autumn can be held in them and sold in good condition in spring.

Many pot plants, especially the hardier types of foliage house plants, can be grown well in shade houses, leaving the glasshouse space free for the more tender plants and for propagating.

Plant hire nurseries find them excellent for holding and rejuvenating hardier plants used for interior decorations.

Building Materials

Many materials may be used for building shade houses. The choice will depend to some extent on the

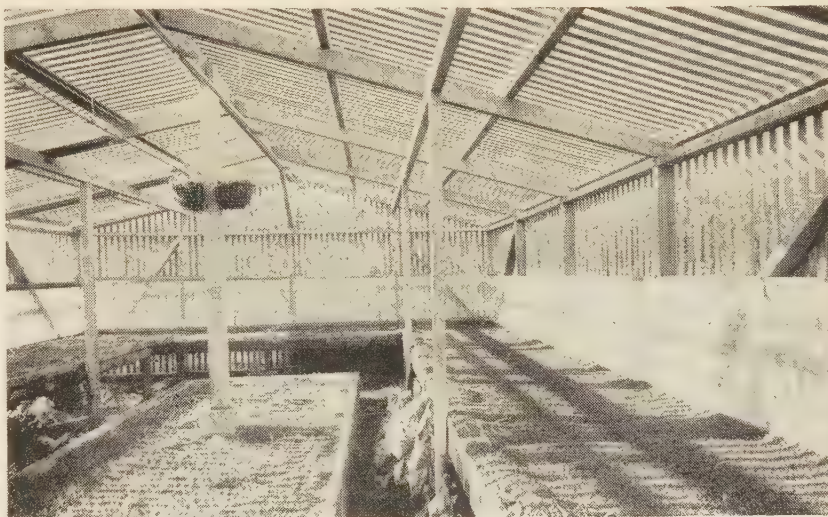
A GARDEN SHADE HOUSE



[Sparrow

▲ A well built shade house used mainly for cymbidium orchids in a small commercial nursery

▼ Interior of the house above. The glass shield round the walls above the benches protects the plants from draughts and wind, and the scoria on the benches, when kept moist, provides cool, humid conditions about the plants. A sprinkler system has been installed for watering and damping down.



[Sparrow

purpose for which they are wanted, but appearance and cost are usually the main factors. Cheap but inelegant structures are just as effective as more elaborate and costly ones.

Manuka brush: The simplest and possibly cheapest shade house is one of manuka brush. The brush is attached to wire netting stretched over a wood or pipe framework. It may be laid on and held in place with wires at 12 to 18 in. intervals or threaded through coarse netting. The latter is a rather laborious process.

The manuka selected is usually about $\frac{1}{2}$ to 1 in. in diameter with the thin brushy top growth left on. It is easier to handle when still green and pliable, but it is difficult to judge the

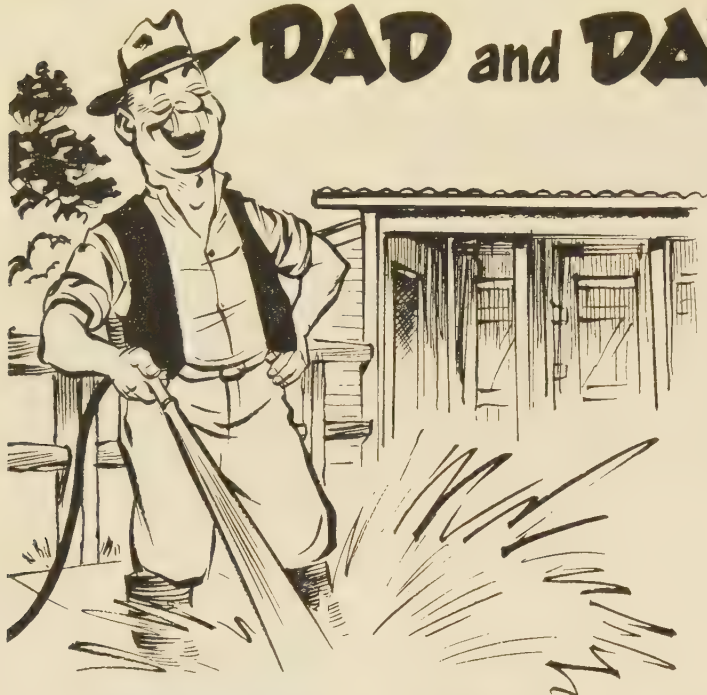
amount of shade which is being provided and what appears to be dense shade may prove to be insufficient when the leaves fall off.

Plants should not be put in the house until the leaves have fallen, because the fallen leaves are unsightly and can cause damage. Seedlings striking from the seeds that fall from the brush can also be a nuisance.

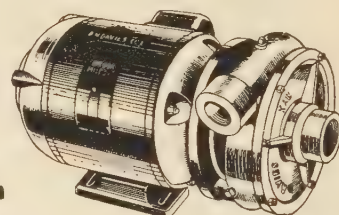
Manuka makes an ideal support for many creepers, but a heavy blanket-ing effect should be avoided, because it is likely to cut down the light too much.

Bamboo may be used in a number of ways. Thin canes about $\frac{1}{2}$ to 1 in. in diameter may be wired on or threaded through netting as described

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for manuka. The spaces between the canes should be about equal to their diameters.

Giant bamboo may be split into strips about 1 in. wide and used in the same way or woven into a basket weave pattern. For the latter the wire netting support is not needed.

Giant bamboos, entire or split in half, may also be used by attaching them to a wood framework. The half canes with concave side up are excellent for roofs, as they carry off some of the rain and prevent much of the drip which is one of the worst problems when plants are grown in shade houses.

Only mature canes at least three years old should be used. They will last many years except when in contact with the soil.

The construction of an all-bamboo shade house with the giant variety was described in the June 1959 issue of the "Journal".

Pungas can be used effectively in an informal garden with a bush setting, but they look rather out of place and too heavy in the average garden. The range of material which can be grown in them is frequently limited to ferns and a few other plants which will stand very heavy shade, for the pungas must be placed fairly close together to break the wind.

If they are spaced well apart to give more light, wind protection is lost and the structure becomes a pergola rather than a shade house.

Scrim or hessian over a wood or pipe frame makes a good temporary shade house for hardening plants off or for winter protection when more suitable structures are not available. The scrim should be treated with a preservative.

Wood laths are probably the most popular building material, for they have a good appearance and if well constructed with treated timber last many years. They may be painted, but as this is a time-consuming job which must be done every two or three years, it is better to allow the wood to weather naturally and so merge into the garden more effectively and provide a neutral background for the plants inside. The laths are usually from 1 to 2 in. wide and an equal space should be left between them.

Vigorous climbers should not be planted against wooden shade houses, for, besides casting too much shade, they can do serious damage by forcing the laths apart and by inducing premature rotting. They also prevent normal maintenance work. If some ornamental planting is wanted on the outside, annual climbers, espaliered shrubs, or climbing hybrid tea roses are more suitable.

Aluminium strips used for making venetian blinds can now be bought in rolls of 250 ft in a range of colours.

They are very light and can easily be attached to a wooden framework.

Aluminium is long lasting and requires no maintenance. To give the same amount of shade as wood laths of similar width they should be placed slightly closer together. As unsecured lengths of 3 ft or more tend to flutter noisily in wind, strips should be woven through at about 2 ft intervals. Aluminium strips may also be threaded through wide mesh netting to hold them securely in place and to stop fluttering, but the appearance is not so attractive and the cost of the house is increased considerably.

Construction

The most suitable position for a shade house is one protected from strong winds, but it should not be heavily shaded by buildings or dense trees. Light shade from deciduous trees with an open habit of growth is often an advantage in summer.

A simple framework of 3 in. x 2 in. timber, angle iron, or iron pipes is satisfactory for a small shade house for the home garden. It does not have to be very strongly braced, as the materials used for shading are mostly light and there is no great wind pressure.

The roof should be strong enough to support heavy hanging baskets. The laths or bamboo, etc., should always run north to south on the roof and vertically on the sides so that the pattern of light and shade moves across the plants as the sun works round. By attaching the laths at spaces equal to their width 50 per cent shade is given. This is suitable for most plants.

The roof may be flat, lean-to, or ridge. The concentrated drip from the rafters is often a nuisance with the two latter. A flat roof tends to spread it more, but there is still a good deal at the rafters.

Where possible the interior layout should be arranged in such a way that the drips fall on the paths rather than on the plants.

The layout will depend very largely on the purpose for which the house is to be used. If it is for tuberous begonias, cyclamen, and similar pot plants, flat or tiered benches would be best. Pot-grown fuchsias, camellias, ferns, and cymbidiums would be better plunged in beds filled with sawdust or peat.

If it is to be used for a decorative display with the plants growing in the soil, good use can be made of rock work. With a little ingenuity all three methods can be introduced so that a wide range of plants can be grown.

Where pot plants stand on benches these may be made of 3 in. x 1 in. slats spaced about 1 in. apart, but a

. . . A GARDEN SHADE HOUSE

solid bench covered with gravel, scoria, moss, or peat is generally better, as it enables a more humid atmosphere to be maintained about the plants, provides more congenial growing conditions for them, and also helps to reduce the amount of watering needed. This can be reduced still further by having the covering material deep enough to plunge the pots, either partly or to their full depth. Corrugated iron and asbestos board are suitable materials for the base on which the gravel, etc., is placed.

Paths should be well formed and well drained, for in summer a good deal of water has to be used for watering and to maintain the humidity. In winter shade and protection from winds prevent quick drying out. Concrete, concrete slabs, brick, and gravel (or scoria) are suitable, but the choice will depend a great deal on the layout and purpose of the house.

Cold draughts in winter often result in poor growth, especially where the plants are growing on the ground or on low benches. Where the house is to be used primarily in this way a solid wall 2 ft 6 in. to 3 ft high is advisable no matter what covering material is used to give shade.

Polythene Lining

Polythene will add much to the usefulness of a shade house. A lining round the sides either full height or part way up will give protection from draughts and wind. Though most plants normally grown in shade houses will stand any wind that filters through the laths, pots sometimes get blown over.

Clay pots which are not plunged dry out very quickly on a windy day even in winter and some wind protection will reduce this. A polythene lining will also provide warmer growing conditions. However, care should be taken not to use too much polythene in summer, as conditions more similar to those of a glasshouse will be created, thus defeating the main purpose for which shade houses are built.

Polythene is particularly useful in winter. Apart from protection from wind and frost, drips and excessive wet can be prevented by covering the roof. In very cold districts the insulating effect of a double layer of polythene (one inside, the other outside) will give better frost protection. A heater can be used in addition.

As unlined shade houses are often cold and wet in winter, very tender plants and those with soft leaves are better removed, as leaf rots can be serious.

Use of Sprinkler System

Where a house is to be used mainly for one type of plant or plants with



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similar habits growing in containers a sprinkler system will save a great deal of work. It is also satisfactory where a range of plants is growing in the soil in beds. In larger commercial houses equipment to introduce fertilisers into the system is worth considering.

Though the main purpose of sprinklers is watering, they can also be turned on briefly for damping down. This consists of a light spray with water over the plants themselves and wetting the benches and paths to promote a cool, humid atmosphere. On hot, dry days it should be done frequently. Damping down and overhead watering also help to hold thrips and red spider in check, as these pests prefer hot, dry conditions.

A simply made portable lath house for covering beds is very useful in nurseries raising seedlings, cuttings, and plants which need some protection from sun and wind but not glass-house conditions. It is made by joining together a series of lath covered panels to form an inverted V. The panels can be made of 3 in. x 2 in. or 4 in. x 2 in. timber with 1 in. or 2 in. laths attached.

Panels 8 ft high placed together at an angle of 45 deg. will cover two 4 ft beds and a 2 ft path. In sheltered positions they may be just propped together and tied with the bases held in position with short stakes. In more exposed positions it is better to nail or tie them to a well braced support.

Work for December

Holiday Preparation



Hedges will be tidy for the holidays if they are clipped early in December. The base should be wider than the top to let in light to maintain life and growth.

If the weather is hot and dry, lawns should not be cut very short and the mowings should be left on to form a light mulch, but if the grass is still

By JOY WATKINS,
Horticultural Advisory Officer,
Department of Agriculture,
Auckland

growing vigorously, it should be cut short and the mowings used with untreated sawdust or other waste material to make compost.



[Sparrow

House plants with firm leaves can be enclosed in plastic for up to five weeks without watering.

In the North Island when *paspalum* appears in lawns of fine-leaved grasses or of Mercury Bay weed it can be killed by spiking the centre of each clump and pouring kerosene into it.

Weed Control in Rose Beds

Rose beds and shrub borders should be given a final weeding, but care should be taken that the many surface roots are not damaged. Roses and other shrubs which were planted last winter may require a good watering. They should be mulched with untreated sawdust and blood and bone or a thin layer of grass mowings free of *Poa annua* seed or other seed before the soil becomes dry.

If mulches are not applied, weed seeds are likely to germinate on the newly cultivated soil. One method of preventing this among established plants is to spray the ground immediately after weeding with monuron, diuron, or simazine. These will kill

germinating weed seeds for four to six months, when a further application can be made.

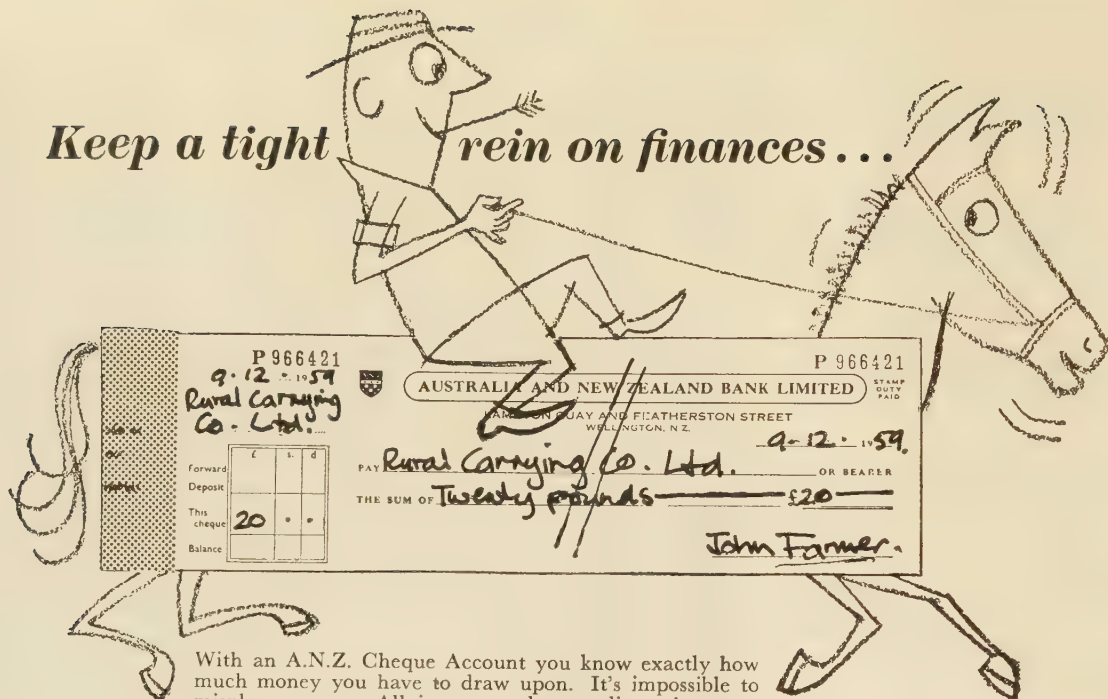
The chemicals are mixed with water and applied with a watering can or sprayer so that the surface of the soil is thoroughly wetted. The amount of water and material can be calculated after a trial using only water. These materials must be applied at no more than 1 oz to 150 sq. yds., and the amount of water used to spread it will depend on the sprayer and operator. Keep the spray mixture well agitated.

Care should be taken to prevent the material from falling on the leaves of roses and other shrubs.

Paths

If weeds are allowed to grow in gravel or tar-sealed paths, they will disturb the surface when removed. Various weedkillers are available which can be dissolved in water and

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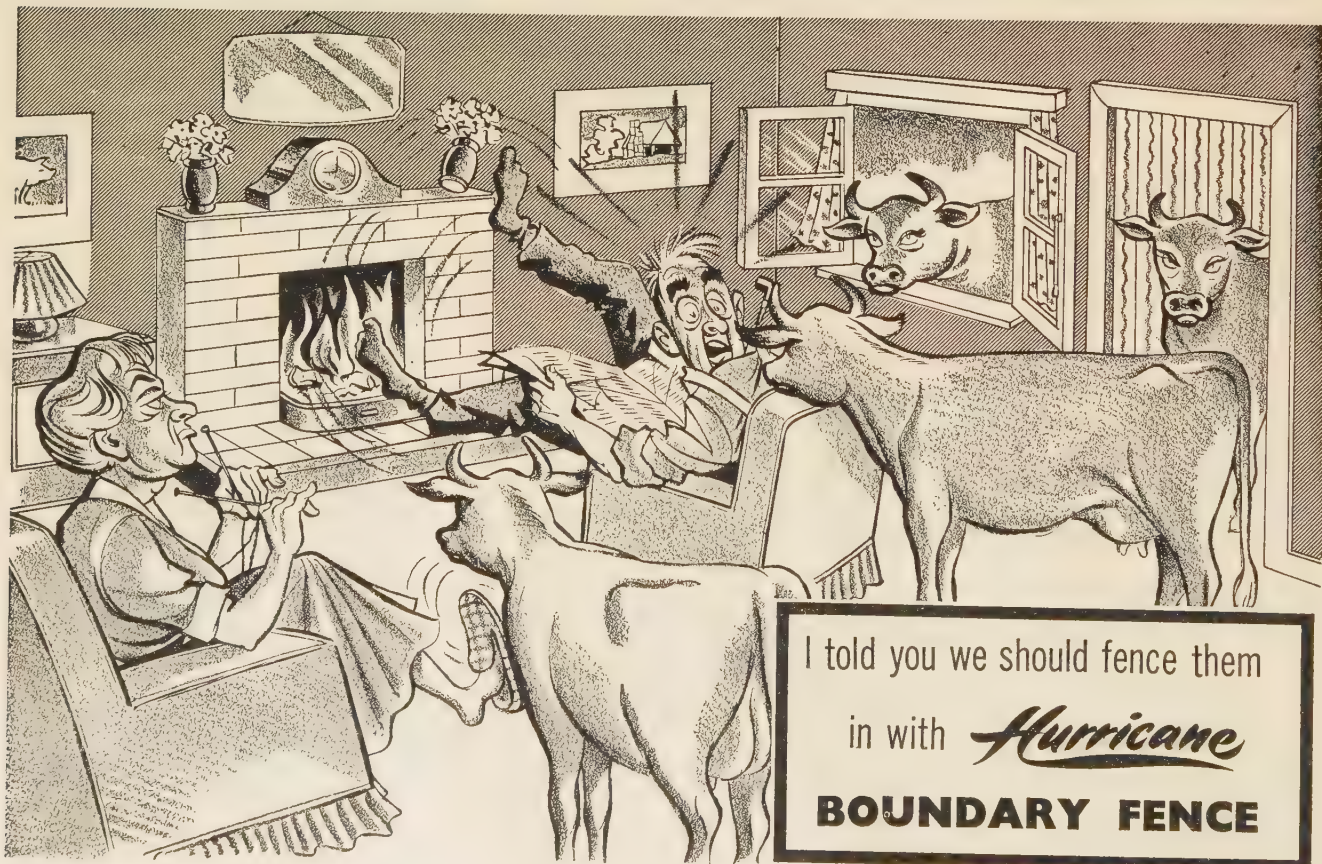


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applied with a watering can. Avoid run-off of weedkiller into garden beds or lawns. Dalapon-amitrol mixtures are probably the safest and easiest to use.

House Plants

During the holidays house plants are growing rapidly and need frequent watering. As far as possible they should be left where they are normally kept, as they are accustomed to the temperature and light there.

Plants with firm leaves, for example, African violets, can be watered, put in a large plastic bag, and sealed, wire or stakes being so placed in the pot that leaves do not touch the plastic. Ventilation holes are not necessary.

Very soft-leaved plants such as maidenhair fern are likely to rot if put in plastic bags. Pots should be placed on bricks or pebbles in a large trough or basin of water so that about $\frac{1}{2}$ in. of the pot is in water. This will keep the soil and roots moist.

Autumn-flowering Bulbs

Plant bulbs of autumn crocus, sternbergia, belladonna, nerines, and anemones between December and March to flower in autumn. In preparing the ground remove weeds, cultivate deeply, and work in bone meal.

Belladonna and nerine bulbs should be planted with the neck above ground in a warm, sunny, well drained position. They do well on banks or beside a north wall.

Small corms of anemones planted 6 in. apart now will form large plants for flowering in autumn. Plant 2 in. deep, with the flat part of the cone-shaped corm uppermost. To hasten growth the corms can be placed in damp moss, peat, or perlite in a plastic bag until they begin to grow. Unless the soil is very fertile, compost or rotted turf should be dug in and a little blood and bone meal and superphosphate worked into the topsoil.

Anemones will not grow well on acid soils, and these should be given a dressing of lime immediately the ground is dug, allowing as long as possible between liming and manuring.

Seed Sowing

Seeds of Iceland poppy sown now on a carefully prepared seedbed or in a frame will provide plants for flowering at the beginning of winter. The seed is very fine, so it must be only thinly covered with finely sifted soil. Water in and shade with scrim if possible.

Pansy, cineraria, *Primula malacoides*, and nemesia can also be sown for winter flowering. Seeds of some perennials, biennials, and shrubs which can be sown now are very slow to germinate, and it is advisable to sow in a frame or in pots or boxes so

that they can be more readily observed.

The use of sterilised soil is an advantage as it eliminates weeds. Many weed seeds germinate rapidly and may smother the slow-growing seedlings, which it is often difficult to distinguish from weeds in the early stages, particularly if one is not familiar with the sown plant as a seedling.

Bearded Iris

Bearded iris should be lifted and divided as soon as they have finished flowering, as that is when new root growth takes place. Divide up the clumps so that each division has at least one fan of leaves and portion of rhizome. Trim back the leaves and replant so that the rhizome is half out of the soil, lying horizontally. A sunny position and well drained soil are desirable.

Most varieties grow well in the South Island. In Auckland and Northland where the winters are too mild for many bearded irises to flower well the following may be tried: Vanity and any others which tend to flower twice in the year, in spring and autumn; also Helen McGregor, Golden Majesty, Hairbell, Lady Boscawen, Snow Flurry, and Fairy Love.

Roses

Complete the pruning of shrubs and ramblers roses, cutting out all shoots which have flowered and any very weak or crowded new growth. Remove dead heads from bush and floribunda roses, cutting back to strong buds which will grow out and produce flowers later in the summer. Do not prune hard at this stage. Water and spray as necessary. If mildew is a problem, spray with $1\frac{1}{4}$ oz of karathane or lime sulphur at 3 oz plus colloidal sulphur at $\frac{1}{2}$ oz in 4 gallons of water.

Shrubs

Check shrubs and citrus for borer, cutting out and burning any small branches which are dying because of borer attack. If sawdust or pieces of bark and webbing are noticed at holes in larger branches or the main trunk, clear the hole with a piece of wire before injecting petrol with a small oil can and seal the hole with petroleum jelly, putty, or similar material.

Some trees and shrubs are particu-

FLOWER GARDEN WORK



[R. W. Orr

Belladonna lilies thrive on poor, dry, sunny banks. Bulbs should be planted in December-April.

larly susceptible to attack by borers and they should be examined regularly. They are citrus, cytissus and genista, hoheria, albizzia, and puriri. Sometimes a branch may be completely ring-barked and this causes it to die.

Floral Decorations

Though flowers are plentiful now, housewives may feel less inclined to arrange them in bowls and vases, as they last for such a short time in a warm atmosphere, particularly when doors and windows are left open to produce a current of air through a room. For this reason extra care should be taken in preparing the flowers and foliage before arranging them, and the finished design should be placed out of draughts and direct sunlight.

Long-lasting foliage can be cut from cabbage tree, flax, sansevieria, and many silver-leaved and succulent plants. Dried material such as pressed silver fern may also be useful.

Simple line arrangements in Japanese style are most suitable for hot summer days. Cool and serene in character, they require a minimum of flowers and a large shallow dish. Any flowers can be used but those naturally associated with water are the most effective.

Water lilies are very beautiful, but close up at night unless molten wax is dropped on to the base of the inner ring of petals to keep them open. As with tulips the petals of mature flowers can be gently recurved so that they are convex instead of concave. They will stay in this position without the aid of wax.

How to Make a Neat Waistband

on a Skirt in Bulky Material

THIS is a quick and easy way to get a neat waistband on a skirt made in heavy tweed, boucle, mohair, or other similar materials.

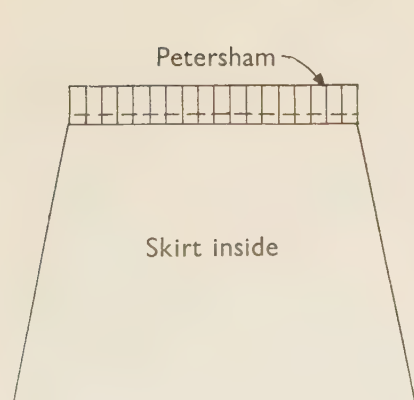
THE secret lies in having only one thickness of heavy material in the band and trimming the seam allowances carefully so as not to cause an uneven finish when pressed.

MATERIALS

A strip of petersham $1\frac{1}{2}$ to 2 in. wide and the same length as your waist measurement.

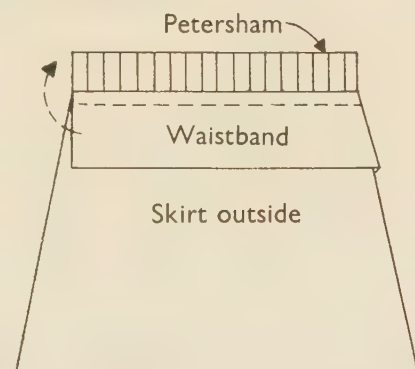
A waistband of the skirt material cut 1 in. longer and 1 in. wider than the petersham to allow for turnings and seam allowances.

METHOD

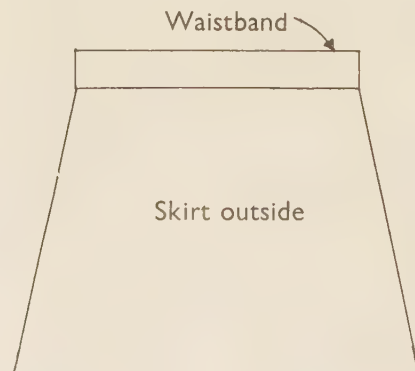


Join the petersham to the inside of the skirt at the waist line.

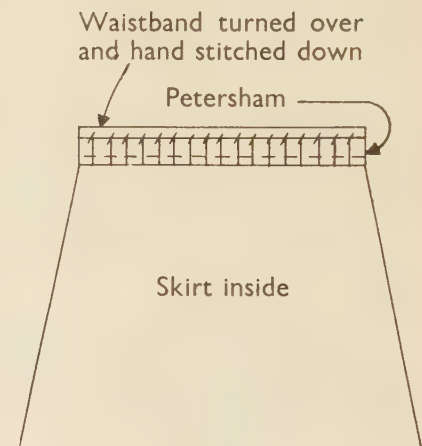
By GWYNNETH V. BOSTOCK,
Home Science Instructor,
Department of Agriculture,
Palmerston North



With the right sides together and allowing $\frac{1}{2}$ in. for seams, sew the lower edge of the waistband to the outside of the skirt just below the previous row of stitching.



Trim away seam allowance. Press the waistband up over the petersham (dotted arrow) and turn in the seam allowance at the top so that it lies between the petersham and the waistband.



Hand sew this edge to the petersham to give a neat finish. Turn in the ends of the waistband and finish with hooks and eyes.

Wrought Iron Furniture

THIS revival from an earlier period is very popular at present. It has a light appearance and is easily looked after. It needs a daily dusting with a soft furniture brush or dry, soft duster.

Painted wrought iron can be kept clean in the same way as any other painted surface. If it is unpainted, a coat of liquid wax may be applied to add dust resistance, but wax should not be used on articles that may be placed near a fire, because wax is inflammable.

Rust stains on unfinished iron can be removed by rubbing first with kerosene and then with steel wool. If the rust resists this first treatment, kerosene should be left on it for a few minutes to soften the rust, after which it can be scrubbed with steel wool.

—MAUD B. STRAIN,
Home Science Instructor,
Department of Agriculture,
Dunedin

For Cooking, Storing, and Carrying Food

Aluminium Foil Will Help You

... and It Has Many Other Uses

By JUDITH FERRIER,
Home Science Instructor,
Department of Agriculture,
Christchurch

ALUMINIUM foil is the answer to a hundred kitchen problems and has proved a most adaptable helper for cooking, storing, and carrying food. However, it has possibilities for much wider use to reduce the time every busy housewife must spend in her kitchen.

THE foil, which looks like heavy silver paper, comes in rolls of about 20 ft which vary in width from 12 in. to 20 in.—wide enough to wrap a turkey. In some countries it is available in different grades, according to weight and thickness, but only one grade is obtainable in New Zealand shops at present. It may be used double or triple thickness if heavy-duty foil is needed.

The superiority of foil over the usual kitchen wrapping materials is that, among other things, it can be easily formed and moulded to retain different shapes, for example, when it is used to cover odd sized containers. It is proof against grease and moisture and does not soften on contact with either, and it will act as an insulator to retain heat or cold fairly well in foods wrapped in it.

Foil given careful treatment can be used several times. It needs only to be wiped with a damp cloth or rinsed in soapy water, smoothed out, and dried in a warm place to make it ready for use again.

COOKING WITH FOIL

Meat Cooked in the Oven

If meat is wrapped and cooked in foil, the juices are sealed in close to the meat, keeping it moist and tender, and do not get a chance to evaporate as they would from an open pan. This method is ideal for cooking lean meats

Mould foil to cover a variety of →
containers in the refrigerator and to
prevent mingling of flavours and loss
of quality from uncovered foods.



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make a date
with the daily orange!



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GIVE IN TO IT' Delicious,
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craving for the high-calorie foods
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vital Vitamin C and the all-import-
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pectins. When diet discipline
chafes, eat an orange whole.



Go for the goodness of
FRESH, JUICY

Oranges

HOW TO SEAL A PACKAGE WITH THE "DRUGSTORE WRAP"



which would normally be stewed or done in a casserole and for meats, such as venison, which tend to dryness. The less tender cuts of meat usually given long slow cooking in liquid can also be satisfactorily roasted or baked and will not shrink or become dried out if they are wrapped in foil and cooked slowly in the oven.

With the tougher cuts it is a good idea to add about $\frac{1}{2}$ cup of liquid to the foil package before sealing it. Water with a little vinegar and Worcestershire sauce, salt, and pepper, and possibly a few herbs will help to make a well flavoured gravy; or blend 1 to 2 tablespoons of packet soup mix (onion, tomato, or mushroom flavour) with the water.

Add 2 to 3 tablespoons of fat to meats to be roasted or baked.

Method: Trim any excess fat and gristle from the meat. Place on a large doubled square of foil. Season, draw up the foil, and add liquid or fat if desired. Fold the foil down several times over the top and in at the ends to make a tight seal. Place in a roasting dish and cook about two and a half to three hours or until done, depending on size. Vegetables can be baked or roasted in the pan at the same time. The usual times and temperatures need not be altered when using the foil.

Poultry

Poultry will remain moist and tender when cooked in foil. Prepare as usual; then place (trussed and breast up) on a doubled square of greased foil. Mould this to the shape of the bird, covering it completely and sealing the foil closely. Put the package on a rack in a roasting dish. Cook at 350 degrees F for the usual time.

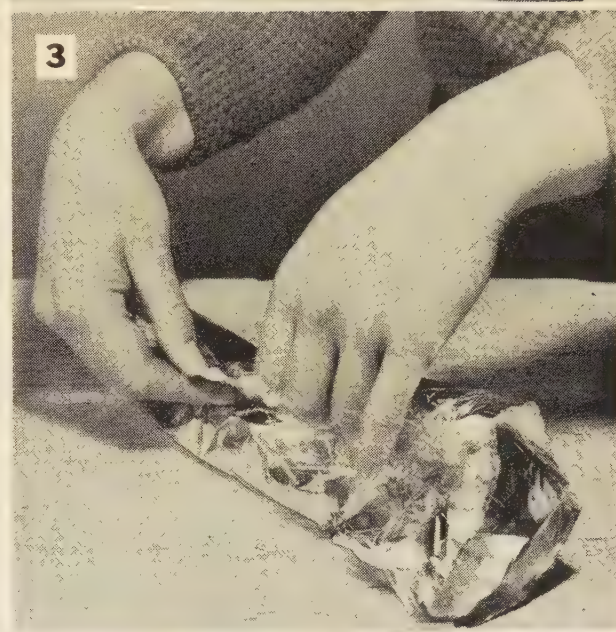
If meat or poultry is to be browned, unwrap the foil and allow the food to finish cooking **uncovered** for the last 20 to 30 minutes. In this time it will develop a good colour if the tempera-

1—Place the food in the centre of a large square of foil.

2—Draw two opposite edges together up over the food.

3—Fold these several times down together on to the surface of the food.

4—Flatten each end and fold several times in toward the centre until the foil is closely sealed round the food.



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ture is raised to 400 degrees. There should be plenty of juices for making the gravy.

For older birds this method seems superior to that of partly cooking them in water and finishing in the oven. It is an excellent way of dealing with large birds, such as turkeys, which are often too big for a covered roasting dish and tend to burn in an open pan because of their height in the oven.

Temperatures are those normally used. No extra time is needed when food is cooked in foil, there are no hard-to-clean roasting dishes in the wash up, and oven cleaning is reduced to a minimum because there is little or no sputtering during cooking.

Remember that food will not brown while covered with foil. To brown uncover for the last 20 to 30 minutes' cooking.

Fish and Small Meat Cuts

Fish and smaller cuts of meat are best cooked in a foil packet. Place on a square of greased double foil. Draw the two long edges together above the food and fold down twice on to it. Flatten the ends and roll in toward the centre to make a completely airtight packet. (See illustrations on page 539.) This is referred to as the "drugstore wrap" in American home freezer handbooks and is one method by which food is wrapped for home freezing. Bake as usual with the packets on the oven tray.

Packet Dinners

Individual packet dinners are a boon when the family has to come in for a meal at different times or when dinner has to be left ready for them. For each dinner arrange the food on a large square of doubled foil buttered in the centre. A good meal would be:

2 mid-loin chops or a piece of grilling steak	1 serving of a seasonable root vegetable, diced
1 medium potato, halved	2 or 3 small tomatoes
1 onion, sliced or chopped	Seasonings

Place the trimmed meat in the centre and surround with the root vegetables. Pre-cook the onion lightly in butter and place on top with the halved tomatoes. Season each layer with salt and pepper and, if desired, mix a little chutney, pickle, or tomato sauce with the onion to give additional flavour.

Seal with the "drugstore wrap" and place the packets, sealed edge uppermost, on a baking tray in the centre of the oven set to 350 degrees. They will take one hour to cook at this temperature. Those needed a little later can be cooked more slowly lower in the oven, or, if it is more convenient, the dinners can be cooked longer at a lower temperature. Each dinner is opened when needed and eaten straight from the packet with a quickly cooked green vegetable or a salad to complete the meal.

For dessert, apples or pears would bake in the same time at 350 degrees, or a cold pudding could be left ready to eat.

Be careful not to tear the foil with sharp bones, or the meat juices and melted butter will leak out into the oven.

This idea can be adapted for picnics and barbecues with great success, either for small numbers or for large-scale entertaining. The packets are placed in the hot coals or on a grid over the fire. Potatoes and other root vegetables, apples, corn on the cob, and even eggs cooked in this way can all be good.

Suggestions for Barbecues

Potatoes

Scrub the potatoes and peel if desired. Slice into four crosswise and insert slices of cheese or onion between the pieces. Season well and wrap each potato closely in buttered foil. Cook about one hour.

For several people, peel and slice the potatoes required to about the thickness of a penny. Arrange in layers on well buttered foil, seasoning each layer with salt and pepper (and finely grated cheese if liked). Pour over the whole $\frac{1}{4}$ cup milk. Seal with the "drugstore wrap" and bake about one hour. Several smaller packets are preferable to one very large packet.

Tomatoes

Use small tomatoes whole or larger ones halved. Seal in a packet and cook for 10 minutes.

Apples and Pears

Core and stuff, if desired, with chopped dried fruit and brown sugar topped with $\frac{1}{2}$ teaspoon of butter. Wrap individually in buttered foil and cook for about 45 minutes.

Bananas

Choose medium firm bananas. Cook whole or slit the skin lengthwise on the inside curve, but do not peel. Make a lengthwise cut in the flesh, sprinkle with lemon juice, and stuff with either 2 tablespoons of grated chocolate or a mixture of 1 tablespoon of brown sugar and $\frac{1}{4}$ teaspoon of cinnamon. Wrap and cook for 10 minutes, turning once.

Eggs

Break each egg directly on to greased foil. Season each and seal closely. Cook over the fire for three to five minutes. Add 1 tablespoon of grated cheese and 2 tablespoons of milk to each packet before cooking if savoury eggs are wanted.

Cooking without a Saucepan

Small servings of vegetables can be cooked without a saucepan if a flat cooking surface is available. Place

the prepared vegetable cut small on a square of doubled foil. Gather up the edges. Add salt and sufficient water to prevent burning. Twist the top to seal and flatten on to the hot surface. Cook for the usual time.

It is possible to cook several vegetables at the one time in only the one saucepan if they are wrapped individually to prevent their flavours from mingling. Place each variety (prepared and seasoned) on a square of foil. Twist at the top to form a bag and put the bags in 1 in. to 2 in. of boiling water in a large saucepan. Keep the lid on and allow time for steaming vegetables.

Asparagus is difficult to cook evenly, but the heads can be kept from flopping if the asparagus stems are placed in boiling water and the heads rested on crumpled foil, where they cook more slowly in the steam. Use a saucepan with a wide base and keep the lid on.

FOIL IN KITCHEN EQUIPMENT

Some of the newer stoves now being produced overseas have a removable foil oven lining which can be changed easily by the housewife, so virtually eliminating oven cleaning. The value of this has not yet been proved conclusively, but many experienced New Zealand cooks line their grill pans and roasting dishes with foil to save on the washing up.

Pie Plates to Individual Design

Pies, small fancy tarts, and pastry cases can be made any size or shape by rolling the pastry out thinly on doubled foil to a circle of the required size. Mould the foil and pastry together to form a shell, trim away the excess foil with kitchen scissors, and flute foil and pastry together round the edge. Bake as usual. Shrinkage during cooking is prevented because the pastry is not stretched to fit the pie plate.

The filling can be baked in or the shell can be baked "blind". This is a work-saving way of making pies for packed lunches. The pie plate can be screwed up when the pie has been eaten, making one dish less to bring home and wash, though the foil can be saved, smoothed out, washed, and re-used.

Wrappings and Moulds

Sandwiches which have to be made ahead will remain soft and moist if they are wrapped and sealed in foil, but because fillings made with egg or mayonnaise should not come into contact with the foil, it is advisable to wrap sandwiches filled with these in greaseproof paper first.

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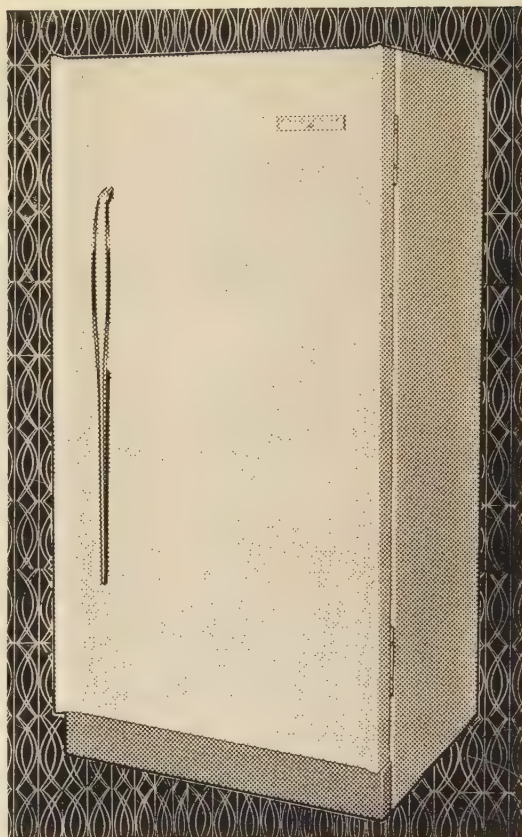
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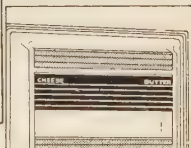


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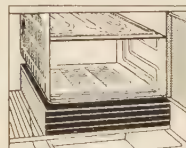
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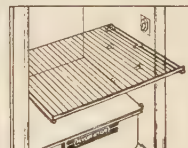
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The chilled blocks of refrigerator cookie dough are sliced $\frac{1}{8}$ in. thick with a very sharp knife. Unused dough is rewrapped in foil and returned to the refrigerator, where it will keep for at least a month.

A loaf of bread wrapped closely in foil will keep moist for several days out of a tin.

Another idea for children's school lunches is to make foil containers by moulding foil round the base of a glass or mug and set jellies or fruit whips in them. Leave enough foil at the top to seal over and exclude dust and pack into the lunch tin when set.

Similar containers are useful for cooking individual savoury dishes and for steamed and baked puddings. At Christmas and for children's parties set home-made sweets in tiny foil cases moulded on the base of an egg cup.

Casseroles and oven dishes without lids can be covered with foil moulded to fit. Food browning too quickly in the oven can be covered with a piece of foil to prevent further darkening.

Brown sugar stored in a foil-lined container will keep soft and moist, and an opened jar of jam covered closely with foil will not become sugary on top.

On Oven Trays

Much time can be saved when biscuits are being baked if two pieces

of foil are used alternately on each oven tray. The foil should be cut slightly smaller all round than the trays. Put the uncooked mixture out on to the foil and when each batch is done slip the foil with cooked biscuits off the tray and replace with the other pieces of foil and the uncooked biscuits.

No time is wasted between batches in waiting for the biscuits to cool before they are firm enough to be transferred to the cooling rack. Grease the foil if this is usually done.

Standby Cookies

The American housewife finds ice box cookies a great standby, as the dough is prepared ahead in quantity, wrapped in aluminium foil, and stored in a refrigerator ready for biscuits to be sliced off and baked in as much time as the oven takes to heat. A basic dough and suggested variations are made as follows:

Ice Box Cookies

3 cups of sifted flour	1½ cups of brown sugar
2½ teaspoons of baking powder	1 egg, well beaten
¾ cup of butter	1 teaspoon of vanilla essence
¼ teaspoon of salt	

(Makes about five dozen)

Sift the flour, baking powder, and salt together twice. Cream the butter and sugar with the vanilla until very light and fluffy. Add the beaten egg and mix well. Blend in the flour mixture thoroughly. The dough will be stiff, but do not be tempted to add more liquid.

Flour the hands and shape the dough into blocks about 6 in. long and 2 in. wide or into rolls about 2 in. in diameter. Wrap each in a double layer of aluminium foil and place in the ice box of the refrigerator for 20 to 30 minutes to chill and harden the dough. Remove and store the wrapped dough on a lower shelf, where it will keep for three weeks to a month.

When fresh biscuits are wanted heat the oven to 375 degrees F and in the meantime unwrap the dough and use a very sharp knife to slice biscuits $\frac{1}{8}$ in. thick on to ungreased oven trays. Bake for 10 to 12 minutes until lightly browned. Store when cold and crisp.

Rewrap and return the remainder of the dough to the refrigerator.

Variations

Divide the mixture into two and add one of the following to each half.

(Continued on page 544)

These Crisp Biscuits Have a Cheesy Tang

THESE savoury biscuits with a crisp shortbread texture are simple to make and keep well in an airtight container. The uncooked dough may be stored in a refrigerator for up to two weeks and the biscuits can be sliced and baked as needed.

Ingredients

$\frac{1}{2}$ lb of mild cheese (grated) 1 lb of flour
 $\frac{1}{2}$ lb of butter $\frac{1}{2}$ teaspoon of mustard (optional)

Beat the butter and cheese to a cream and blend in the flour and mustard to make a very stiff dough. Knead the mixture with the hands if necessary.

Divide the dough in half and shape it into two rolls each 12 in. long and 2 in. in diameter. Wrap the rolls in waxed paper and chill in the refrigerator until firm (at least three hours).

Slice the chilled dough into $\frac{1}{4}$ in. slices and place on ungreased oven trays.

Bake at 400 degrees F for 12 to 15 minutes until light golden-brown. Remove the biscuits from the tray immediately and let them cool on a wire rack.

If desired, one cup of finely chopped nuts may be added to the dough, or the baked biscuits may be frosted with a thin, tart lemon icing made from one teaspoon of butter, two teaspoons of lemon juice, and half cup of icing sugar.



[Sparrow

The well chilled roll of uncooked dough is easily sliced for baking, and the biscuits look attractive decorated in patterns with a tart lemon icing.

Aluminium Foil

(Continued from page 543)

Chocolate biscuits: Add 1 $\frac{1}{2}$ tablespoons of cocoa to the dry ingredients.

Mocha biscuits: Add 1 $\frac{1}{2}$ teaspoons of cocoa and 2 teaspoons of powdered instant coffee.

Spice biscuits: Add $\frac{1}{2}$ teaspoon each of cinnamon, ground cloves, and nutmeg to the dry ingredients.

Nut biscuits: Add $\frac{1}{2}$ cup of very finely chopped nuts to the dry ingredients.

Spotted biscuits: Add 2 oz of dark chocolate chopped into small pieces to the dry ingredients.

Choconut biscuits: Add 1 $\frac{1}{2}$ tablespoons of cocoa and $\frac{1}{2}$ cup of desiccated coconut to the dry ingredients.

Chequers biscuits: Make plain and chocolate dough. Form separately into sticks about 1 in. across and 6 in. long. Press four together firmly,

alternating dark and light on top and bottom. Wrap and chill.

Bullseye biscuits: Make plain and chocolate dough. Form the chocolate into sticks about 6 in. long and 1 in. in diameter. Roll the plain dough $\frac{1}{4}$ in. thick into oblongs 6 in. long and about 3 in. wide. Wrap firmly round the chocolate centre. Wrap and chill.

The dozens of variations in flavours and patterns which are possible make the dough well worth having on hand.

Large Quantities of Ice Cream

The problem of making and storing large quantities of ice cream at home for special occasions is solved by lining the trays with aluminium foil. Do this neatly as you would a cake tin and allow sufficient depth of foil at the sides to fold over the top of the mixture when it is frozen. Pour in and freeze the mixture as usual. When it is solid, remove from the tray by pulling gently on the foil at both ends.

Fold the foil down over the block of ice cream to seal it completely and store in the ice cream compartment, where several wrapped blocks can be held safely for a few days, leaving the trays free.

To serve, simply unwrap and slice. This method gives much neater portions than those spooned directly from the tray. If deeper than usual blocks are desired, use a foil-lined meat loaf tin, but remember to allow extra time for freezing the greater depth of mixture.

Aluminium foil has a very definite place in the home freezing of foods, too, but its uses are by no means limited to the kitchen. One well known magazine recommends punctured aluminium foil to its younger readers as an excellent covering for tin cans containing live fishing bait, as apparently it keeps it fresh.

Photographs by Green and Hahn.

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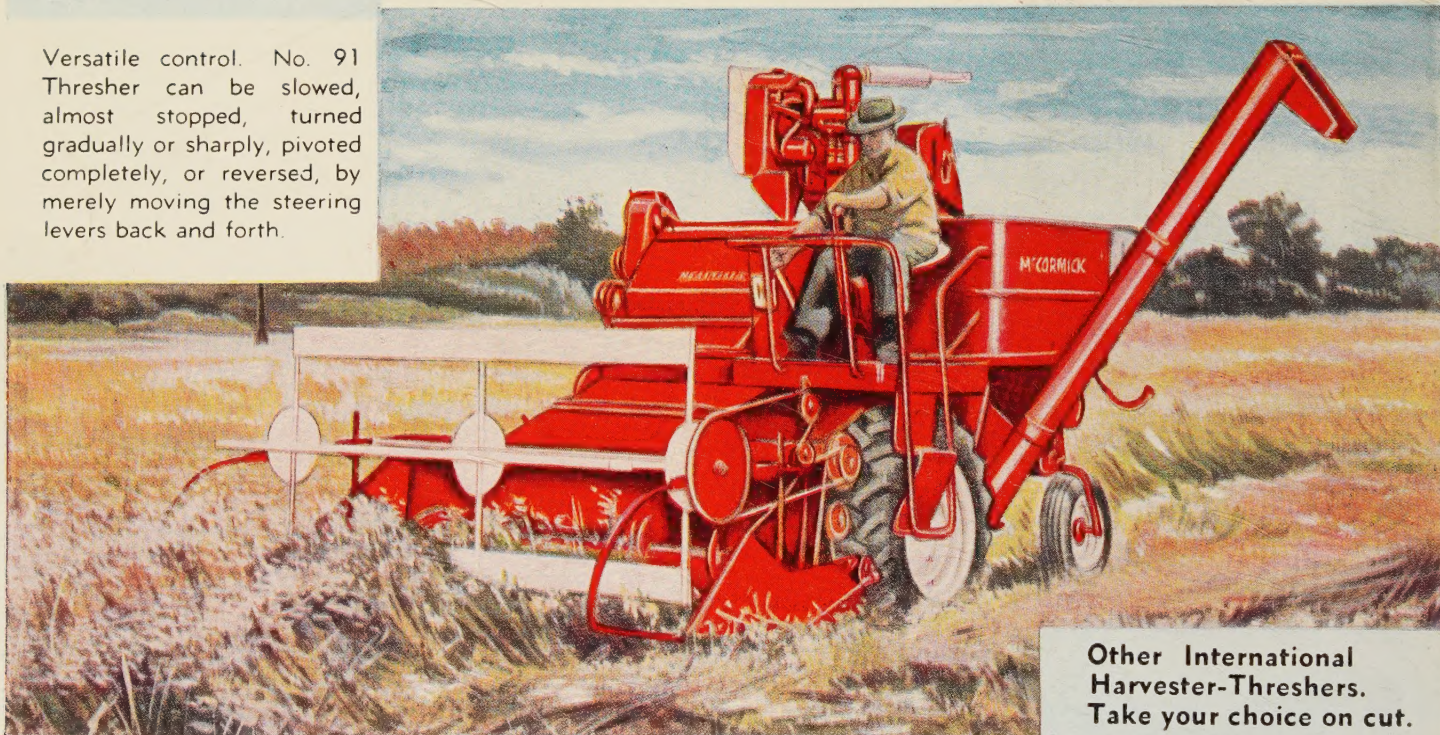
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